Outer Continental Shelf Air Permit Application

Revolution Wind Farm

Prepared for:

Revolution Wind, LLC
56 Exchange Terrace, Suite 300
Providence, Rhode Island 02903

Prepared by:

Tech Environmental
303 Wyman Street, Suite 295
Waltham, Massachusetts 02451

May 1, 2022

VERSION 1.0

Table of Contents

Tables

Acronyms and Abbreviations

3D-UHRS	3D Ultra High Resolution Seismic
ACC	air-cooled condenser
APE	Area of Potential Effects
BACT	Best Available Control Technology
BC	black carbon
bhp	brake horsepower
BOEM	Bureau of Ocean Energy Management
btu	british thermal units
CA ADC	California Adminstrative Code
CAA	Clean Air Act
CARB	California Air Resources Board
CatOx	oxidation catalyst
CCCT	combined-cycle combustion turbine
CFR	Code of Federal Regulations
CH_4	methane
CI	compression ignition
CMR	Code of Massachusetts Regulations
CMV	commercial marine vessel
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COA	Corresponding Onshore Area
COP	Construction and Operations Plan
CPA	Massachusetts Comprehensive Plan Application
CPS	Cable Protection System
CT	combustion turbine
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTG	combustion turbine generator
CTV	crew transport vessel
CVA	Certified Verification Agent
DOC	diesel oxidation catalyst
DP	dynamic positioning
DPS	dynamic positioning system
EPA	United States Environmental Protection Agency
ERC	emission reduction credit
ERP	Emission Reduction Plan
FAA	Federal Aviation Administration
FDR	Facility Design Report
FIR	Fabrication and Installation Report

FR	Federal Register
FRAP	Flat Rock Assembly Plant
ft	foot/feet
g/BHP-hr	grams per brake horsepower-hour
g/HP-hr	grams per horsepower-hour
g/kW-hr	grams per kilowatt-hour
GACT	Generally Available Control Technology
GE	General Electric
GHG	greenhouse gas
GT	gross ton
GWP	global warming potential
H_2SO_4	sulfuric acid mist
HAP	Hazardous Air Pollutant
HC	hydrocarbon
HOC	hydrophobic organic compounds
HP	horsepower
hr/yr	hour(s) per year
HRSG	heat recovery steam generator
HVAC	high voltage alternating current
IAC	Inter-array Cable
ICE	internal combustion engine
ICF	Interconnection Facility
ITR	ignition timing retardation
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt(s)
kW	kilowatt(s)
L	liter(s)
LAER	Lowest Achievable Emission Rate
lb(s)	pounds(s)
lb/hr	pound(s) per hour
lb/Mmbtu	pounds per million British thermal units
LNG	liquified natural gas
LOA	length overall
LPA	Massachusetts Limited Plan Approvals
m	meter(s)
MA WEA	Massachusetts Wind Energy Area
MACT	Massachusetts Achievable Control Technology
MassDEP	Massachusetts Department of Environmental Protection
MEC/UXO	munitions, explosives of concern/unexploded ordinance
MMbtu/hr	million British thermal units per hour
MW	megawatts

N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standard(s)
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NH_3	ammonia
NHDES	New Hampshire Department of Environmental Services
nm	nautical mile
NMHC	non-methane hydrocarbon
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NOA	Nearest Onshore Area
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
NSR	New Source Review
O&M	Operations and Maintenance
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OnSS	Onshore Substation
OSS	Offshore Substation
OTR	Ozone Transport Region
Pb	lead
PBSA	Massachusetts Public Benefit Set Aside program
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than than 2.5 micrometers in aerodynamic diameter
PSD	Prevention of Significant Deterioration
PTE	potential to emit
PVC	polyvinyl chloride
RACT	Reasonable Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
RICE	Reciprocating Internal Combustion Engine
RIDEM	Rhode Island Department of Environmental Management
RI-MA WEA	Rhode Island/Massachusetts Wind Energy Area
ROW	right of way
rpm	revolutions per minute
RWEC	Revolution Wind Export Cable
RWF	Revolution Wind Farm
SCAQMD	South Coast Air Quality Management District
SCR	selective catalytic reduction
SF_6	sulfur hexafluoride
SFW	South Fork Wind, LLC
SFWF	South Fork Wind Farm
SI	spark ignition

SIP	State Implementation Plan
SO_2	sulfur dioxide
SOV	service operations vessel
SO_X	sulfur oxides
STG	steam turbine generator
TNEC	The Narragansett Energy Company
TP	transition piece
tpd	tons per day
tpy	tons per year
USC	United States Code
USCG	United States Coast Guard
USLD	ultra-low sulfur diesel
VOC	Volatile Organic Compounds
WA	work area
WTG	wind turbine generator

EXECUTIVE SUMMARY

Revolution Wind, LLC (Revolution Wind), a 50/50 joint venture between Orsted North America, Inc. and Eversource Investment, LLC, proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The purpose of the Project is to provide clean, reliable offshore wind energy that will increase the amount and availability of renewable energy to New England consumers while creating the opportunity to displace electricity generated by fossil fuel-powered plants and offering substantial economic and environmental benefits to the New England Region. Massachusetts, Rhode Island, Connecticut, and New York have adopted substantial renewable portfolio standards and clean energy targets to address issues associated with climate change, highlighting the current and future demand for this Project. In response to this expressed need and demand, Rhode Island and Connecticut have awarded Revolution Wind three Power Purchase Agreements (PPAs), totaling 704 MW of generation capacity. The Project will fulfill Revolution Wind's obligations to both Connecticut and Rhode Island in accordance with the PPAs and provide substantial environmental and economic benefits.

The Project is defined within the Revolution Wind Construction and Operations Plan (Revolution-Wind 2021) using a Project Design Envelope (PDE) approach. The PDE defines "a reasonable range of project designs" associated with various components of a project (e.g., foundation and WTG options) (BOEM 2018). The PDE for the Project is based on a maximum operating capacity ranging between 704 and 880 megawatts (MW) and includes the following primary assumptions: up to 100 wind turbine generators (WTGs) connected by a network of Inter-Array Cables measuring up to 155 miles (mi) (250 kilometers [km]) in total length; up to two Offshore Substations (OSS), connected by an up to 9 mi (15 km) long OSS-Link Cable; up to two export cables (i.e., the RWEC) measuring up to 50 mi (80 km) in length; up to two underground transmission circuits (referred to as the Onshore Transmission Cable) located onshore and measuring up to 1 mi (1.6 km); and a new Onshore Substation and Interconnection Facility (ICF) and associated interconnection circuits.

The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area). The RWEC will make landfall at Quonset Point in North Kingstown, Rhode Island and will interconnect to the existing electric transmission system via the Davisville Substation, which is owned and operated by The Narragansett Electric Company (TNEC), located in North Kingstown, Rhode Island.

The following OCS Preconstruction Air Permit application for Revolution Wind's up to 880 MW Project has been prepared by Tech Environmental, Inc. (Tech) to fulfill the regulatory requirements of the United States Environmental Protection Agency's (EPA) OCS Air Regulations, codified under Title 40 Code of Federal Regulations, Part 55 (40 CFR 55).

The Lease Area is located in federal waters on the OCS approximately 15 nautical miles (nm) southeast of Point Judith, Rhode Island, 13 nm east of Block Island, Rhode Island, approximately 7.5 nm south of Nomans Land Island National Wildlife Refuge (uninhabited island), and between approximately 10 to 12.5 nm south/southwest of varying points of Rhode Island and Massachusetts coastlines. The lease area itself is approximately 98 square nm, 13 nm wide and 19 nm long at its furthest points. The WTGs will have a nameplate capacity of 8 to 12 MW per turbine. The WTGs will be situated in an approximate 1.15 mile (mi) (1 nm, 1.8 km) by 1.15 mi grid, aligned with layouts proposed for other project in the Rhode Island/Massachusetts Wind Energy Area (RI-MA WEA) and Massachusetts Wind Energy Area (MA WEA). Because the exact configuration of WTGs in the Lease Area is not yet finalized, this application conservatively assumes a maximum design scenario of all 100 WTGs being installed. Ultimately, Revolution Wind will construct the number of WTGs necessary to satisfy its Power Purchase Agreements with the states of Rhode Island and Connecticut.

The Project will also require the construction and O&M of onshore facilities, including a landfall location at Quonset Point in North Kingstown, Rhode Island; up to two underground transmission circuits co-located within a single corridor which will connect to a new Onshore Substation (OnSS) and Interconnection Facility (ICF) located adjacent to the existing Davisville Substation. The onshore facilities themselves are not included within the permit application since this activity will occur beyond the extent of the 25-nm radius area that would be subject to the OCS Preconstruction Air Permit, as defined in 40 CFR 55. t..

In March 2020, the Project submitted a Construction and Operations Plan (COP) to the Bureau of Ocean Energy Management (BOEM), and on April 30, 2021, BOEM published a Notice of Intent to prepare an Environmental Impact Statement. Revolution Wind assumes that all state and federal permits will be issued between Q1 and Q3 2023. Construction is anticipated to begin in 2023 following the receipt of all necessary approvals. Construction will begin with the installation of the onshore components and initiation of seabed preparation activities (clearing of debris and obstructions). The construction period is expected to occur over 12 to 18 months. Once commissioned, the Project is expected to have an operational life of 20 to 35 years, meaning that decommissioning activities would begin between 2044 and 2079. Decommissioning activities would be separately permitted at the relevant time.

During operation, the WTGs will not generate air emissions. Rather, electricity generated by the WTGs will displace electricity generated by higher-polluting fossil fuel-powered plants and significantly reduce emissions from the ISO New England power grid over the lifespan of the Project. Based on ISO New England's annual non-baseload emission rates, the estimated avoided emissions from the Project were calculated based on the range 704-880 MW of electricity production and the 20-35 years of operation. The Project is expected to reduce CO_2 emissions by 1,114,000 to 1,392,000 tons per year (tpy), or 22,276,000 to 48,730,000 tons over the project life. NO_X emissions are expected to be reduced by 600 to 750 tpy, or 11,990 to 26,220 tons over the project life. The Project will provide clean, renewable electric power to Rhode Island and Connecticut.

However, to construct and maintain the Project, fuel-combusting emission sources will be necessary, including commercial marine vessels, non-road construction equipment, helicopters, emergency generators and on-road vehicles. These emission sources will occur onshore in the case of on-road vehicles, emergency generators, and non-road construction equipment used at the construction staging areas, landfall location, along the transmission circuit route, and at the OnSS and ICF (and would not be subject to the OCS Preconstruction Air Permit). Offshore emissions (which would be subject to the OCS Preconstruction Air Permit) would occur primarily within the Lease Area on the OCS and would consist of commercial marine vessels, some non-road equipment, helicopters, and emergency generators. Some emissions will occur along the RWEC corridor during the installation of the RWEC, but the RWEC itself is not an OCS source and the RWEC installation will not use any vessels that will meet the definition of an OCS source, so the emissions associated with the RWEC are not included in the PTE as discussed further in Section 3.1. Transiting vessels will also generate emissions between the ports of call and the Lease Area.

The potential port facilities to be used to support construction of the Project include existing ports in New York, Rhode Island, Connecticut, Massachusetts, Virginia, Maryland, or New Jersey. During O&M the potential ports to be used to support the Project include existing ports in New York and Rhode Island. When necessary due to limited availability of specialized vessels, a vessel may originate from Europe, although this vessel would not be Jones' Act compliant and would not travel to any US ports.

However, not all the vessels used as part of the construction or O&M activities will necessarily meet the definition of an OCS source. The OCS Air Regulations, implanting Section 328(a)(1) of the Clean Air Act (CAA), establish air pollution control requirements for OCS sources to attain and maintain Federal and State ambient air quality standards. 40 CFR 55.6(b) requires operators of OCS sources to submit an application for a permit prior to commencing construction. 40 CFR 55.2 defines an OCS source as follows:

OCS source means any equipment, activity, or facilities which:

1) Emits or has the potential to emit any air pollutant.
2) Is regulated or authorized under the Outer Continental Shelf Lands Act ("OCSLA") (43 U.S.C Section 1331, et. Seq.).
3) Is located on the OCS or in or on waters above the OCS.

This definition shall include vessels only when they are:

1) Permanently or temporarily attached to the seabed and erected thereon and used for the purposes of exploring, developing, or producing resources (therefrom, within the meaning of Section 4(a)(1) of OCSLA (43 U.S.C Section 1331, et, seq.).
2) Physically attached to an OCS facility, in which case only the stationary source aspects of the vessels will be regulated.

As required by Section 328 of the CAA, when a vessel does not meet the definition of an OCS source, the emissions from vessels servicing or associated with any part of the OCS source are still included in the potential emissions from the facility when the vessel is within 25 nautical miles of the centroid of the source, including while traveling to and from any part of the OCS facility. For the purposes of determining potential emissions, EPA has determined that it is appropriate to use the center of the source as the point to estimate vessel emissions within 25 nautical miles of the facility. Within this application, the centroid of RWF was determined by finding the average of the proposed WTG locations. However, this approach conservatively assumes that the WTGs meet the definition of an OCS source during the construction, commissioning, and O&M of the Project. In Appendix A, Revolution Wind presents a justification for excluding the WTGs from the source determination for the Project. Depending on the outcome of discussions with Region 1 related to the source determination and Appendix A, Revolution Wind may submit an amendment to this application which would present the potential to emit (PTE) with the WTGs not included as OCS sources. Therefore, as an initial conservative approach, all vessel emissions within 25 nautical miles of the centroid (as determined by proposed WTG locations) were used for determining the potential emissions for this application.

The OCS Air Regulations, codified in 40 CFR 55, differ from regulations for onshore stationary emissions sources because the OCS air regulations require inclusion of construction and supporting vessel air emissions when determining if a project is subject to air permitting as a major source of air emissions. Because construction vessel emissions are counted against the permitting thresholds, the Project's potential emissions exceed the Prevention of Significant Deterioration (PSD) thresholds for NO_X, CO, PM_{10}, $PM_{2.5}$, VOC, and GHGs. Furthermore, the Project exceeds the Nonattainment New Source Review (NNSR) thresholds for NO_X and VOCs.

As required by section 328 of the CAA, when a vessel does not meet the definition of an OCS, the emissions from vessels servicing or associated with any part of the OCS source are still included in the potential emissions from the facility when the vessel is within 25 nautical miles of the centroid of the source, including while traveling to and from any part of the OCS facility. from vessels are not regulated by specific control technology requirements when the vessel does not meet the definition of an OCS source and is not itself a stationary source. However, these emissions are still included when determining the number of NO_X offsets required, and when determining the impact of emissions on ambient air and Class I areas (i.e., dispersion modeling). Therefore, the application discusses all emission sources within the 25 nm range, but not all emissions will necessarily be subject to the permit.

Pursuant to 40 CFR 55.3, OCS sources located within 25 miles of States' seaward boundaries are subject to the federal requirements set forth in 40 CFR 55.13 and the federal, state, and local requirements of the corresponding onshore area (COA) set forth in 40 CFR 55.14. With Massachusetts having been the designated COA, the Project will be subject to the applicable requirements of the most current Massachusetts Air Regulations that are listed in Appendix A of 40 CFR 55. The applicable federal, state, and local requirements of the COA are discussed in Section 5 of this application.

Notable requirements incorporated by reference into 40 CFR 55.13 and 55.14 include New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAPs), PSD Review, Massachusetts' Plan Approval Requirements, and NNSR.

The Project's OCS sources will comply with the performance standards of NSPS Subpart IIII. The Project will not be a major source of hazardous air pollutants (HAPs) and is therefore an area source of HAPs. The only NESHAPs expected to apply to the Project is 40 CFR 63 Subpart ZZZZ for Stationary Reciprocating Internal Combustion Engines. The Project is subject to PSD review. Consequently, the Project's OCS sources must meet federal Best Available Control Technology (BACT) requirements for each regulated NSR pollutant that it would have the potential to emit in significant amounts.

Massachusetts' plan approval requirements under 310 CMR 7.02 are incorporated by reference into the OCS Air Permit Regulations. The Project requires a Comprehensive Plan Application (CPA) because the Project is subject to PSD review. Because the Project is subject to the plan approval requirements of 310 CMR 7.02, the Project must implement BACT for all criteria pollutants and not just those that exceed the PSD thresholds. Section 6.5 and 6.7 present a federal and Massachusetts' BACT analysis for the Project, respectively.

NNSR requirements in Appendix A to 310 CMR 7.00 apply in any OCS area for which the COA is designated a nonattainment area. Dukes County, which is part of the designated COA, is the only county in Massachusetts that is in marginal nonattainment with the 2008 8-hour ozone standard. Notably, Dukes County is in attainment with the more recently promulgated 2015 8-hour ozone standard. The entire Commonwealth of Massachusetts is in attainment for the remaining criteria pollutants. Since a portion of the Project's COA is in nonattainment for ozone and the Project's potential NO_X and VOC emissions during construction exceed the major source threshold of 50 tpy, the Project's OCS sources are subject to NNSR. As part of the NSR program, the Project will be required to acquire offsets and implement the Lowest Achievable Emission Rate (LAER) for its NO_X and VOC emissions. The LAER analysis can be found in Section 6.5.

Pursuant to 40 CFR 55.4(a), Revolution Wind submitted this air permit application to EPA within 18 months of the submittal date of the revised NOI. During the preparation of this application, Revolution Wind consulted with the Region 1 air quality team. Pre-application meetings to discuss the permit application were held between Revolution Wind and Region 1 on several occasions dating back to May of 2020.

1. APPLICATION OVERVIEW

Revolution Wind, LLC (Revolution Wind), is submitting this Outer Continental Shelf (OCS) source air permit application as required by the OCS Air Regulations in Code of Federal Regulations (CFR) Title 40, Part 55.6, for the proposed installation and operation and maintenance (O&M) of the Revolution Wind Farm (RWF) and the Revolution Wind Export Cable (RWEC), collectively referred to as the Project. Since decommissioning of the Project will be done after the 20- to 35-year operational phase, a separate OCS air permit application will be submitted for decommissioning prior to the conclusion of the operational period.

This air permit application is being submitted to the Administrator through the U.S. Environmental Protection Agency (EPA) Region 1 Office in Boston, Massachusetts. Revolution Wind has been involved in ongoing discussions with Region 1 related to the Project's source determination and whether RWF and South Fork Wind Farm (SFWF) qualify as adjacent sources per EPA's interpretation of "stationary source" provided in a November 26, 2019 memorandum (EPA, 2019). Per comments from EPA regarding Revolution Wind's air dispersion modeling protocols, Region 1 recently made a preliminary determination that the two projects are the same stationary source for Clean Air Act permitting purposes. Region 1 agreed that, despite the recent preliminary determination, this application can treat Revolution Winds's OCS sources as new sources, rather than a modification of the neighboring wind farm's sources. Revolution Wind does not agree with this preliminary determination.

For purposes of Title V, none of the individual projects should be considered part of the same stationary source because the pollutant-emitting activities are not proximate and are therefore not adjacent. The individual turbines will not have emergency diesel generators, nor will they contain switchgear with SF6. After commissioning, therefore, the individual turbines will not have a potential to emit and are not pollutant-emitting activities. The remaining pollutant-generating activities will be the offshore substations (and vessels transiting to/from within 25 nm thereof) as well as an occasional jack up vessel used for repairs on an as-needed (but not recurring) basis. For example, the offshore substations will be several nautical miles away from the nearest pollutant emitting activity in an adjacent or nearby lease area.

EPA's adjacency guidance stresses that there is no bright line outside of the oil and gas context, and that adjacency may vary depending on the nature of the industry. Still, it strains reason why emitting activities greater than ¼ mile onshore are not aggregated while non-emitting activities 1nm apart offshore would be. The guidance does caution that sources should not be "over-aggregated in a manner inconsistent with the 'common sense notion of a plant' if adjacency were determined based on physical proximity alone." (Guidance at 8) But the Orsted lease areas that EPA considers potentially adjacent total approximately 350,000 acres—more than 1/3 the acreage of the state of Rhode Island. Aggregating a source to that size arguably goes well beyond the "common sense notion of a plant." In other words, it's the adjacency of the pollutant emitting activities that is relevant, not whether the lease areas themselves are adjacent. Therefore, this application does not attempt to rebut EPA's preliminary determination and the lack of rebuttal contained within should not be interpreted as acceptance or agreement with the preliminary determination. If Revolution Wind chooses to rebut the preliminary source determination it will be done in an amendment to the application.

To satisfy the requirements of 40 CFR 55.4(a), Revolution Wind submitted a Notice of Intent (NOI) for the Project to the EPA Region 1 office, MassDEP Air and Climate Programs and Southeast Region Office, RI DEM Office of Air Resources, NHDES Air Resources Division, and CTDEEP Air Bureau. The NOI was originally submitted on May 5, 2020 but was replaced by a revised NOI on November 5, 2021. The NOI contained a preliminary estimate of the Project's potential emissions. A copy of the NOI can be found in Appendix B. As determined by Region 1 following receipt of Revolution Wind's NOI, Massachusetts is the designated Corresponding Onshore Area (COA) for the Project. Following the designation, Region 1 determined whether a consistency update was necessary to incorporate Massachusetts requirements into

40 CFR 55.14. As required by 40 CFR 55.6(a)(1)(ii), this application includes an applicability determination of the federal and Massachusetts air requirements with respect to the RWF and RWEC construction and operations and maintenance (O&M).

The application includes a project description, description of emissions associated with the Project, air emission estimates for OCS sources associated with the Project, and a discussion of applicable state and federal air requirements, Best Available Control Technology (BACT) and Lowest Achievable Emission Reduction (LAER) analysis, as well as offsets analysis.

Additional detail of this Project beyond that included in this air permit application can be found in the Construction and Operations Plan, Revolution Wind Farm (COP) (current version dated December 2021).

The information for the permit applicant is provided below.

General Company Information

Company Name and Address:

Revolution Wind, LLC

56 Exchange Terrace, Suite 300

Providence, RI 02903

Owner's Name and Address:

Owner: Revolution Wind, LLC

Agent: Claus Bøjle Møller

Facility Site Contact:

Claus Bøjle Møller/Revolution Wind, LLC

56 Exchange Terrace, Suite 300

Providence, RI 02903

857-348-3279

claum@orsted.com

2. PROJECT DESCRIPTION

The Project's components are grouped into four general categories:

- The Revolution Wind Farm (RWF), inclusive of the WTGs, OSSs, IACs, and OSS-Link Cable.
- The RWEC–OCS, inclusive of up to 19 mi (30 km) of the RWEC in federal waters.
- The RWEC–RI, inclusive of up to 23 mi (37 km) of the RWEC in state waters.
- Onshore Facilities, inclusive of the Landfall Work Area, Onshore Transmission Cable, OnSS, and ICF (including associated interconnection circuits/ROWs).

The Revolution Wind Farm (RWF) includes up to 100 WTGs with a nameplate capacity of 8 to 12 megawatts (MW) per turbine, up to 155 miles (250 km) of submarine cables between the WTGs (the IACs), and up to two offshore substations (OSS) connected by an up to 9-mile (15 kilometer) OSS link cable. RWF will be linked to the onshore facilities by up to two submarine export cables (the RWEC) generally co-located in a single corridor. The project will be located within federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area)[1] approximately 15 miles (13 nm) east of Block Island, Rhode Island, and approximately 8.5 miles (7.5 nm) south of Noman's Island National Wildlife Refuge (uninhabited island), and between approximately 12 to 14 miles (10 to 12.5 nm) south/southwest of varying points of the Rhode Island and Massachusetts coastlines.

The RWEC is an alternating current electric cable that will connect the RWF to the existing mainland electric grid in North Kingstown, Rhode Island. The RWEC will be located within both federal waters (RWEC-OCS) and Rhode Island State territorial waters (RWEC-RI) and be buried to a target depth of 4 to 6 feet (1.2 to 1.8 meters) in the seabed. The RWEC will be approximately 42 miles (67 kilometers) in length and will be connected to the Onshore Transmission Cable via Transition Joint Bays (TJBs) located underground at Quonset Point in North Kingston, Rhode Island.

The Onshore Facilities include a new interconnection facility (ICF) and new onshore substation (OnSS). The ICF will be an expansion of the preexisting Davisville Substation, which is owned by The Narragansett Electric Company d/b/a National Grid (TNEC). The OnSS will be located adjacent to the Davisville Substation. An underground right of way (ROW) will connect the OnSS with the ICF, and an overhead ROW will connect the ICF with the existing Davisville Substation. An Onshore Transmission Cable of up to 1 mile (1.6 kilometers) in length made up of two underground circuits will be located in a single corridor in North Kingston, Rhode Island and will connect the RWEC with the OnSS.

Construction is expected to begin in 2023 following receipt of all necessary approvals and will begin with the installation of the onshore components and initiation of seafloor preparation activities. This air permit application and associated air dispersion modeling conservatively assumes construction would complete within 12-months, though construction could occur over 18 months. Revolution Wind will be responsible for the construction, operations, and maintenance (O&M), and decommissioning of the Project.

2.1. Construction

The general process for installation of the Project involves the installation of the foundations to the sea floor and preparation of the structures for the WTGs and the OSS. Work vessels then supply all the WTG components and install them on the foundations. RWF plans to install a monopile foundation for each WTG.

1 On January 10, 2020, a request was made to BOEM to segregate Lease Area OCS-A 0486 to accommodate both the Revolution Wind Farm Project and SFWF Project. The Revolution Wind Farm Project retained lease number OCS-A 0486 while a new lease number was assigned for the SFWF Project (OCS-A 0517).

Offshore construction for the Project is anticipated to be completed in the following general sequence, which is further described in subsequent sections:

- Mobilization of vessels
- Export cable and inter-array cable route clearance
- Transportation of the foundations
- Installation of the OSS foundation
- Installation of the WTG foundations
- Installation of the WTGs
- Installation of the export cable and inter-array cable
- Topside installation

The WTG commissioning phase begins when the first WTG is installed offshore.

2.1.1. Export Cable

Offshore, the RWEC (inclusive of up to two cables) will be installed within the approximate 1,312-foot (400-meter) wide ROW. The total width of the disturbance corridor for installation of the RWEC will be up to 131 ft (40 m) per cable, inclusive of any required sand wave leveling, dredging, and boulder clearance. Dynamic Positioning (DP) vessels will generally be used for cable burial activities. If anchoring (or a pull ahead anchor) is necessary during cable installation it will occur within an approximate 1,312 ft (400 m) wide ROW, although EPA does not consider pull-ahead cable laying vessels to be OCS sources.

Burial of the RWEC will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the RWEC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. Where burial cannot occur, sufficient burial depth cannot be achieved, or protection is required due to cables crossing other cables or pipelines, additional cable protection methods may be used (cable protection is discussed further below). The location of the RWEC and associated cable protection will be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

Installation of the RWEC consists of a sequence of events, including pre-lay cable surveys, seabed preparation, cable installation, joint construction, cable installation surveys, cable protection, and connection to the OSSs, as summarized in Table 2-1. It is anticipated that construction of the RWEC will be completed within approximately 8 months.

Table 2-1 Typical Export Cable Construction Sequence

Activity/ Action	Construction Summary
Pre-lay Cable Surveys	Prior to installation, geophysical surveys will be performed to check for debris and obstructions that may affect cable installation.
In-site MEC/UXO Disposal	Prior to seabed preparation, for confirmed munitions, explosives of concern/unexploded ordinance where avoidance is not possible, in-situ disposal will be done with low order (deflagration), high order (detonation) methods, cutting the MEC/UXO to extract the explosive components, or through relocation ("lift and shift").
Seabed Preparation	Seabed preparation will include required sandwave leveling, boulder clearance and removal ofany Out of Service Cables. Boulder clearance trials may be performed prior to wide-scale seabed preparation activities to evaluate efficacy of boulder clearing techniques.

Pre-Lay Grapnel Run(PLGR)	PLGR runs will be undertaken to remove any seabed debris along the export cable route. A specialized vessel will tow a grapnel rig along the centerline of each cable to recover any debristo the deck for appropriate licensed disposal ashore.
Cable Installation	The offshore cable laying vessel will move along the pre-determined route within the established corridor towards the OSSs. Cable laying and burial may occur simultaneously usinga lay and bury tool, or the cable may be laid on the seabed and then trenched post-lay. Alternatively, a trench may be pre-cut prior to cable installation. Cable lay and burial trials within the Area of Potential Effects (APE) but not within the areas of archaeological sensitivity may be performed prior to main cable installation activities to test equipment. Anchoring during cable installation may extend beyond the 131 ft (40 m) wide disturbance corridor, but will be confined to the APE.
Joint Construction	Installation of the RWEC will require offshore subsea joints due to the length of the RWEC (up totwo per cable. The subsea joint will be protected by marinized housing approximately four times the cross- sectional diameter of the cable. The joint housing will be protected using similar methods to those described below for Cable Protection. In case of repair due to damage additional joints may be required during construction.
Cable Installation Surveys	Cable installation surveys will be required, including pre- and post-installation surveys, to determine the actual cable burial depth. Depending on the instruments selected, type of survey, length of cable, etc. the survey will be completed by equipment mounted to a vessel and/or remote operated vehicle.
Cable Protection	Cable protection in the form of rock berms, rock bags and/or mattresses will be installed as determined necessary by the Cable Burial Risk Assessment, and where the cable crosses existing submarine assets. Cable protection will be installed from an anchored or DP supportvessel that will place the protection material over the designated area(s).
Connection to OSS	At the OSSs, the export cables will be pulled into each OSS and secured.

2.1.2. WTG and OSS Foundations

Revolution Wind has committed to an indicative layout scenario with WTGs sited in a grid with approximately 1.15 mi (1 nm) by 1.15 mi (1 nm) spacing that aligns with other proposed adjacent offshore wind projects in the RI-MA WEA.

Designing and optimizing the layout of WTGs and OSSs is a complex, iterative process taking into account a large number of inputs and constraints including, but not necessarily limited to: site conditions (e.g., wind speed and direction, water depth, seabed conditions, environmental constraints, and seabed obstructions); design considerations (e.g., WTG type, installation set-up, foundation design,and electrical design); and stakeholder considerations (e.g., safe navigation and commercial and recreational fishing). As such, Revolution Wind requires flexibility to micro-site foundations. In accordance with 30 CFR § 585.634(c)(6), micro-siting of foundations will occur within a 500-ft (152-m) radius around locations identified in the indicative layout scenario. Revolution Wind will acquire 3D Ultra High Resolution Seismic (#d-UHRS) data to microsite foundations and avoid boulders. The seismic cube produced will cover an area large enough to allow Revolution Wind to relocate foundations to avoid boulders of a size which could cause refusal of a pile during piling operation. 3D-UHRS surveys have developed during the last decade and is now widely used to identify constraining features relative to pile driving such as boulders. The 3D-UHRS method is considered to be more efficient and reliable than acoustic coring.

A number of operations will be completed prior to the foundation installation process, including:

- **Geophysical Surveys**: to identify seabed debris and potential UXO.
- **Geotechnical Surveys**: to identify the geological, archaeological, and cultural resource conditions.
- **MEC/UXO Clearance Surveys**: to identify and confirm MEC/UXO targets for removal/disposal.
- **Seabed Debris Clearance**: removal of seabed debris, boulder clearance, etc. where necessary to ensure the seabed is suitable for safe foundation installation. Revolution Wind assumes boulder clearance will occur within a 656 ft (200 m) radius centered on the foundations to ensure safe foundation installation as well as safe vessel jack-up.

Foundations will be installed following completion of these operations, as summarized in Table 2-2. Monopile foundations will be driven to target embedment depths using impact pile driving and/or vibratory pile driving. Installation of a single monopile foundation is estimated to normally require 1 to 4 hours (6 to 12 hours maximum) of pile driving; up to three monopile foundations will be installed in a 24-hour period. The WTG monopile installation campaign is expected to be completed in a single 5-month campaign.

Table 2-2 Typical Monopile Foundation Installation Sequence

Activity/Action	Installation Details
Foundation Delivery	Monopiles may be transported directly to the Lease Area for installation or to the construction staging port. Monopiles (and transition pieces [TPs] if used) are transported to site by an installation vessel or a feeder barge.
Foundation Setup	At the foundation location, the main installation vessel upends the monopile in a vertical position in the pile gripper mounted on the side of the vessel. The hydraulic hammer is lifted on top of the pile to commence pile driving.
Pile Driving	Piles are driven until the target embedment depth is met, then the pile hammer is removed and the monopile is released from the pile gripper.
TP Installation (if used) or Secondary Structures Installation	Once the monopile is installed to the target depth, the TP or separate secondary structures will be lifted over the pile by the installation vessel. If used, the TP will be bolted to the monopile.
Completion	Once installation of the monopile and TP is complete, the vessel moves to the next installation location.

Final engineering design may indicate that scour protection is necessary for the monopile foundation. Scour protection is designed to prevent foundation structures from being undermined by hydrodynamic and sedimentary processes, resulting in seabed erosion and subsequent scour hole formation. The shape of the foundation structure is an important parameter influencing the potentialdepth of scour hole formation.

It is anticipated that scour protection will be installed prior to installation of the foundations. Several types of scour protection may be considered, including rock placement, mattress protection, sandbags,and stone bags. However, rock placement, in which large quantities of crushed rock are placed around the base of the foundation structure, is the most frequently used solution. The rock placement scour protection solution may comprise of a rock armor layer resting on a filter layer. The filter layer can either be installed before the foundation is installed (‘pre-installed’) or afterwards (‘post-installed’).

2.1.3. Offshore Substations

Up to two OSSs, each with a maximum nominal capacity of 440 MW, will be required to support the Project’s maximum design capacity. An OSS is an offshore platform containing the electrical components necessary to collect the power generated by the WTGs (via the IAC), transform it to a higher voltage for transmission and transport of that power to the Project’s onshore electricity infrastructure (via the export cables). The purpose of the OSS is to stabilize and maximize the voltage of power generated offshore, reduce the potential electrical losses, and transmit electricity to shore. The following subsections describe the design and construction of the Project's OSSs.

The typical sequence for OSS installation is summarized in Table 2-3. It is anticipated that installation and commissioning of the OSSs will occur within an approximate 4-month window, not including cable pull-in.

Table 2-3 Typical OSS Construction Sequence

Activity/Action	Construction Details
Foundation Delivery and Installation	The OSS will be supported by a monopile foundation. The foundation, delivery, and installation process is described in Table 2-2.
Topside Installation	The topside platform, including the transformer module and switchgear, will be assembled as a single unit prior to being transported to the Lease Area via a heavy transport vessel or barge. This expedites the lift of the module onto the foundation. The lift will commence using a suitable installation vessel and the topside platform will be lowered onto the pre- installed foundation. The topside is then secured into position by use of grouted, bolted, or welded connection. This step will occur following installation of the OSS foundation.
Commissioning	Once the OSS topside is secured to the foundation, the RWEC, OSS-Link Cable, and IAC will be connected. Communication systems will be set-up with the shore, as well as lighting, fire- fighting system, etc. Once all systems are enabled, the electrical systems will be commissioned using back-feed (i.e., electricity is fed to the OSS from the onshore grid via the export cables). When completed, the OSS is operational.

2.1.4. OSS Link Cable

The two OSSs will be connected by an up to 9-mi (15-km)-long 275 kV HVAC OSS-Link Cable. Design and construction of the OSS-Link Cable will generally be the same as outlined for the RWEC in Section 2.3.1.

Installation of the OSS-Link Cable will require similar methods described for offshore construction of the RWEC. Burial of the OSS-Link Cable will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the OSS-Link Cable will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.

Revolution Wind assumes up to 10 percent of the OSS-Link Cable route will require secondary cable protection in areas where burial cannot occur, sufficient burial depth cannot be achieved due to seabed conditions or to avoid risk of interaction with external hazards. Based on a review of site-specific geophysical data, Revolution Wind further assumes up to 60 percent and up to 10 percent of the total OSS-Link Cable route will require boulder clearance and sandwave leveling and/or dredging, respectively, prior to installation of the cables. The location of the OSS-Link Cable and associated cable protection will be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts. The duration for installation of the OSS-Link Cable is included in the approximate 4-month window for OSS installation and commissioning.

2.1.5. Inter Array Cables

The IAC will carry the electrical current produced by the WTGs to the OSSs. The length of the entire network of IAC will be up to 155 mi (250 km).

The IAC will be installed within a 131-ft (40-m) -wide corridor. Burial of the IAC will typically target a depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth for the IAC will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.

Installation of the IAC will follow a similar sequence as described for the RWEC in Table 2-1, with two exceptions:

- After pre-lay cable surveys and seabed preparation activities are completed, a cable-laying vessel will be pre-loaded with the IAC. Prior to the first end-pull, the cable will be fitted with a Cable Protection System (CPS) and the cable will be pulled into the WTG or OSS. The vessel will then move towards the second WTG (or OSS). Cable laying and burial may occur simultaneously using a lay and bury tool, or the cable may be laid on the seabed and then trenched post-lay. Alternatively, a trench may be pre-cut prior to cable installation. The pull and lay operation, inclusive of fitting the cable with a CPS, is then repeated for the remaining IAC lengths, connecting the WTGs and OSSs together.
- The IAC will typically not require in-field joints; thus, "Joint Construction," as described for the RWEC, will generally not be required. However, joints may be required in case of a cable repair.

Installation methods for the IAC will be similar to those described for the offshore portion of the RWEC. As described for offshore construction of the RWEC, seabed preparation (specifically boulder clearance and sand wave leveling) will be required; boulder clearance trials, as previously described for the RWEC, may also be implemented prior to wide-scale seabed preparation activities.

Like the RWEC, the IAC will pass through areas of boulder fields linked to the geology (namely Pleistocene glacial till/moraine close to the surface). Based on a review of site-specific geophysical data, it is assumed that a boulder plow may be used in all areas of higher boulder concentrations, conservatively estimated at up to 80 percent of the entire IAC network. Both within these areas of higher boulder concentrations and outside of these areas, a boulder grab may be used to remove larger and/or isolated targets. It is further assumed that up to 10 percent of the total IAC network will require sand wave leveling and/or dredging to facilitate cable installation. Each array cable will typically take 1 day to lay and bury. It is anticipated that installation of the complete IAC system will be completed within approximately 5.

Cable protection strategies will be required for the IAC. Revolution Wind assumes up to 10 percent of the entire IAC network may require secondary cable in areas where burial cannot occur, sufficient burial depth cannot be achieved due to seabed conditions or to avoid risk of interaction with external hazards. There may be crossings of the Project's RWEC and IAC that will require cable protection, in which case rock berm or concrete mattress separation layers will be installed over the previously installed cable prior to installing a crossing cable, while the rock berm or concrete mattress cover layers will be installed after cable installation. The location of the IAC and associated cable protection will be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

2.1.6. WTGs

The Project will consist of up to 100 WTGs, sited in a grid with approximately 1.15 mi (1 nm) by 1.15 mi (1 nm) spacing.

The typical sequence for WTG installation is summarized in Table 2-4. It is currently estimated that the construction of each WTG may take up to 36 hours allowing for vessel positioning and completion of all lifts; however, to allow time for vessel maneuvering between WTG locations as well as weather downtime, the total duration of the installation campaign for the WTGs is expected to be approximately 8 months. Vessel activity during installation of WTGs will occur within a 656 ft (200 m) radius centered on foundations cleared during seabed preparations.

No gensets are expected to be used during WTG installation. Power will be provided by the jack-up vessel performing the installation work. During the commissioning phase, the WTGs will be powered by the integrated battery backup system and are not anticipated to require the use of a genset. However, if the battery backup system were to fail, or not provide sufficient power for the full duration of commissioning, temporary gensets on the WTGs would be required until the WTGs are connected to and are able to be powered by the grid.

Table 2-4 Typical WTG Construction Sequence

Activity/Action	Construction Details
Transport	WTG components will be transported to the laydown construction port to prepare components for loading and installation. Activities include pre-assembling tower sections, as well as preparing the nacelles, blades, and equipment necessary for WTG installation. The WTGs are anticipated to be transported to the Lease Area by either an installation vessel or feeder vessel.
WTG Towers	Once positioned, the installation vessel will install the tower either as a single lift if pre-assembled, or in multiple lifts for separate sections. The tower is then bolted to the foundation.
WTG Nacelle	Installation vessel then installs nacelle on top of the tower and secures it with bolts.
WTG Blades	Blades are installed either as a pre-assembled full rotor or in single lifts.
Commissioning	Once the WTG installation is complete the installation vessel will move on to the next installation location. Commissioning of the turbine will be executed by commissioning technicians working from separate commissioning vessels.

2.1.7. Construction Vessels

Construction of the Project will require the use of an array of vessels. During construction, heavy lift vessels, tugboats, barges, platform supply vessels, and jack-up vessels will be used to transport the WTG, monopile, and OSS components to the lease area. Installation of the WTGs, monopiles, and OSSs is expected to be performed using a combination of jack-up vessels and DP crane vessels. It is anticipated that scour protection will be installed around the WTG and OSS foundations using a specialized rock-dumping vessel. Crew transport vessels and service operations vessels will be used to support the installation of the RWF components. To reduce noise impacts from the construction, a bubble curtain will be maintained via an anchor handling vessel. Four sound field verification vessels will be positioned around pile driving to monitor for sound.

Crew transfer vessels and helicopters are expected to be used to transport personnel to and from the work area. Additional geophysical survey work will likely be conducted to ensure adequate understanding of seabed conditions around the offshore cable system and scour protection, which will require the use of survey vessels.

The maximum number of vessels used during construction is anticipated to be approximately 44. Table 2-5 provides a representative list of the types of vessels that are expected to be used during the Project's construction. Table 2-5 is organized by major construction element and includes the basic data on anticipated vessel type and use.

2.1.8. Generators

Installation and commissioning of the RWF will require the use of generators. Some of the generators will be located on vessels, and some will be located on the OSSs.

A 597-kW standby generator will be installed on each OSS prior to commissioning. These generators are permanent and will remain on the OSSs during the operations and maintenance phase. The generators are expected to be used for only 10 hours during commissioning.

Two 156 kW generators will be temporarily installed on each OSS for the installation and commissioning phase of the OSS construction. The generators will supply the topside with power during installation and commissioning and are expected to run for a total of 4,380 hours. Use of the temporary generators will reduce the demand on the permanent OSS generators.

The commissioning of each WTG will require a source of power. The WTGs will be powered by an integrated battery backup system and are not anticipated to require the use of a generator, However, in the unlikely scenario that there is not enough wind to charge the battery back-up system ahead of commissioning, 37 kW on-vessel generators will be used to temporarily power the WTG for commissioning.

During the installation of the IAC to the WTGs, 37 kW on-vessel generators will be used during the cable pull-in, which would require about 6 hours of generator use per turbine, for a total of 600 hours. During the installation of the IAC to the OSSs, 75 kW generators will be used during cable pull-in, which would require about 120 hours of total generator use.

2.1.9. Construction Equipment

Construction of RWF and RWEC will also require vessel auxiliary generators, cranes, and cherry pickers. Many of the onboard generators will be negligible at less than 10 kW, but a few larger generators will be used to power air compressors that will supply compressed air to noise mitigation devices (e.g. bubble curtains) during pile-driving. Larger generators will charge power packs used to power hydraulics. Other trivial sources of emissions may result from as-needed supporting activities such as welding, grinding, and sanding. A few cherry pickers will be used onboard vessels to support installation activities.

All vessel and equipment specifications are subject to change due to availability at the time of construction and limitations associated with the Jones Act. Vessel data will remain highly speculative throughout the permitting of the Project and vessel selection will be refined much closer to the start of construction. However, vessels may be changed out even after construction begins.

Anticipated vessels and equipment to be used during construction are described in the Table 2-5.

Table 2-5 Description of Vessels and Equipment During Construction

Emission Source	Description of Source
Crew transport vessels	Transport crew to the Project Area
Heavy lift installation vessels	Lift, support, and orient the components of each WTG and OSS during installation Used for foundation installation
Cable lay and burial vessels	Lay and bury transmission cables in the seafloor
Rock dumping vessels Pre-lay grapnel runs vessels	Deposit a layer of stone around the WTG and OSS foundations to prevent the removal of sediment by hydrodynamic forces May place cable protection over limited sections of the offshore cable system
Boulder clearance vessels	Clear the seabed floor of debris prior to laying transmission cables
Tugboats	Transport equipment and barges to the work area
Heavy transport vessels	Transport large project components to the work area

Platform supply vessels	Transport steel to the work area
Anchor handling tug supply vessels	Install underwater noise mitigation devices (e.g. bubble curtains) Support offshore export cable installation when needed
Jack-up vessels	Transport WTG components to the work area Extend legs to the ocean floor to provide a safe, stable working platform Used for offshore accommodations
Sandwave clearance (dredging) vessels	Used in certain areas prior to cable laying to remove the upper portions of sand waves
Survey vessels	Used to perform geophysical and geotechnical surveys
Sound field verification vessels	Monitor sound fields during piledriving
Service operation vessels	Transport crew to the Project Area Provide offshore living accommodation and workspace
Onboard Generators	Supply power for air compressors and power packs
Temporary diesel generators	Temporarily supply power to the OSSs during installation and commissioning
Permanent diesel generators	Supply power to the OSS for brief periods during commissioning
Non-road equipment	Power the hydraulic hammer used for pile driving
Helicopters	Transfer crew to the work area

2.1.10. Tentative Construction Schedule

Revolution Wind assumes all state and federal permits will be obtained between Q1 and Q3 2023. Construction will begin as early as Q2 2023 with installation of the onshore components and initiation of seabed preparation activities (clearing of debris and obstructions). Construction durations (inclusive of commissioning) are summarized below:

- OnSS and ICF – approximately 18 months
- Onshore Transmission Cable – approximately 12 months
- RWEC – approximately 8 months
- RWEC Landfall – approximately 3 months
- WTG Foundations – approximately 5 months
- IAC – approximately 5 months
- WTGs – approximately 8 months
- OSSs (including foundations and OSS-Link Cable) – approximately 4 months

2.2. Operations and Maintenance

Per the Lease, the operations term of the Project is 25 years but could be extended to 30 or 35 years. The operations term will commence on the date of COP approval. To support O&M, the Project will be controlled 24/7 via a remote surveillance system (i.e., SCADA).

The O&M Plan for both the Project's onshore and offshore infrastructure will be finalized as a component of the FDR/FIR review process; however, a preliminary O&M plan for the onshore facilities,foundations, offshore transmission assets, and WTGs is provided in the following sections. As noted previously, various existing ports are under consideration to support offshore construction, assembly and fabrication, crew transfer and logistics (including for O&M activities).

During the Project's 20- to 35-year operational period, the Project's WTGs will not generate air emissions. Rather, electricity generated by the WTGs will displace electricity generated by higher-polluting fossil fuel-powered plants and significantly reduce emissions from the ISO New England power grid over the lifespan of the Project.

Operations and maintenance will require frequent CTV and SOV use for routine daily O&M activities. Infrequently, survey vessels will be used to perform routine surveys of foundations and cables that will be carried out in years 1 and 2, and every 3 years thereafter, or after a major storm event (1 in 50-year storm). Non-routine repairs may require the use of jack-up vessels, cable burial vessels, cranes, and cherry pickers.

The RWF components will primarily be powered by the wind farm. During periods when the wind is not sufficient for the WTGs to operate normally, or if the WTGs are not operating for any other reason, RWF may draw power from the onshore grid via the bi-directional export cable. If shore power is not available, power will be supplied by the WTGs' integrated battery backup system that can provide auxiliary power to the WTGs in the event of a temporary outage. The battery backup system can be charged by the WTG when operating. In the unlikely scenario where shore power from the grid is not available, the WTGs are not producing electricity, and the previous three days did not have wind to charge the battery back system, a temporary diesel generator would be used. As discussed in Appendix A, Revolution Wind does not believe that the remote possibility of the use of a temporary diesel generator meets the definition of an OCS source.

The OSSs will have permanently installed 597 kW generators that will be used to power the OSSs in the event of an outage where shore power is not available, and the WTGs are not providing power. The generators will be used under both emergency and standby conditions. During O&M, the OSS generators may be used occasionally to provide power during routine maintenance of the OSS (if grid power is unavailable or the maintenance being performed requires disconnection from the grid). It is expected that the usage of the generators will not exceed 200 hours per year per generator unless an emergency event were to occur.

It is possible that the Project's offshore facilities will require a major repair during the Project's 20- to 35-year lifespan. A major repair to the WTGs or OSSs would closely resemble the process of installing the WTGs and OSSs. Emission sources during a major repair would be the same as those used for routine O&M, but more vessels would be at the WDA for a longer period. Consequently, potential air emissions during a year in which a major repair occurs would exceed annual emissions during routine O&M. Because of the infrequent and uncertain nature of a major repair, Revolution Wind is not including emissions associated with major repairs in this permit application. Should such an event occur in future years, Revolution Wind would seek the appropriate regulatory guidance and approvals at that time.

2.2.1. Export Cables, OSS-Link Cables, and IAC

Revolution Wind will employ a proprietary state-of-the-art asset management system to inspect offshore transmission assets including the OSS (electrical components), RWEC, IAC, and OSS-Link Cable.This system provides a data-driven assessment of the asset condition and allows for prediction and assessment of whether inspections and/or maintenance activities should be accelerated or postponed. This approach allows the Project to maximize O&M efficiencies.

The RWEC, IAC, and OSS-Link Cable typically have no maintenance requirements unless a fault or failure occurs. To evaluate integrity of the assets, Revolution Wind intends to conduct an as-built survey/bathymetry survey along the entirety of the cable routes immediately following installation (scope of installation contractor). Bathymetry surveys will be performed one year after commissioning, two to three years after commissioning, and five to eight years after commissioning. Survey frequency thereafter will depend on the findings of the initial surveys (i.e., site seabed dynamics and soil conditions). A survey may also be conducted after a major storm event (i.e., greater than 10-year event). Surveys of the cables may be conducted in coordination with scour surveys at the foundations.

Should the periodic bathymetry surveys indicate that the cables no longer meet an acceptable burialdepth (as determined by the Cable Burial Risk Assessment), the following actions may be taken:

- Alert the necessary regulatory authorities, as appropriate.
- Undertake an updated cable burial risk assessment to establish whether cable is at risk from external threats (i.e., anchors, fishing, dredging).
- Survey monitoring campaign for the specific zone around the shallow buried cable.
- Assess the risk to cable integrity.
- Based on the outcome of these assessments, several options may be undertaken, as feasible, permitted,and practical:
- Remedial burial if feasible and practical.
- Secondary protection (rock protection, rock bags or mattresses).
- Increased frequency of bathymetry surveys to assess reburial.

It is possible submarine cables may need to be repaired or replaced due to fault or failure. Also, it is expected that a maximum of 10 percent of the cable protection placed during installation may require replacement/remediation over the lifetime of the Project. These maintenance activities are considered non-routine. If cable repair/replacement or remedial cable protection are required, the Project will obtain necessary approvals. These activities will result in a short-term disturbance of the seabed similar to or less than what is anticipated during construction; these activities will be limited to the disturbance corridors previously defined for construction of the RWEC, OSS-Link Cable, and IAC.

2.2.2. WTG and OSS Foundations

A summary of WTG and OSS foundation maintenance activities and the indicative frequency at which they may occur is provided in Table 2-6. Maintenance requirements (including frequencies) referenced in this table are used to support analyses in this permit application and are subject to change based on final design specifications and manufacturer requirements. Detailed information regarding maintenance and required frequencies will be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction.

Table 2-6 Foundation Maintenance Activities

Maintenance/Survey Activity	Indicative Frequency
Above water inspection & maintenance Visual inspections for deterioration of coating system, inspection of corrosion, damage within the splash zone, reading of meters, inspection of alarm logs, etc.	Annual
Seabed Survey Bathymetry, scour, etc.	At 1 year after commissioning, 2 to 3 years after commissioning, and 5 to 8 years after commissioning; frequency thereafter will depend onthe findings of the initial surveys
Subsea inspection To detect, measure and record deterioration that affects structural integrity,including inspection of corrosion, minor maintenance activities that can beperformed without outage/ reduced power production (yield)	3 to 5 years or defined based on risk

Major maintenance	Every 8 years
Corrective Maintenance Coating repair, inspection of corrosion and maintenance, maintenance activitiesthat can be performed without outage/ reduced power production (yield)	As needed

2.2.3. Offshore Substations

The OSSs will house equipment for high-voltage transmission, including one high-voltage shunt reactor on each OSS, and medium-voltage 66-kV and 275-kV high-voltage gas-insulated switchgears. The high-voltage equipment on the OSS is expected to be rated between 220-kV and 400-kV. In addition to these components, the OSS will be equipped with low-voltage systems including SCADA supplying the topside platform with electrical power and lighting. This includes auxiliary systems for protection control, communication, and light. An emergency diesel generator system will support necessary equipment in case of a power outage.

Though the OSSs will be unmanned, additional facilities on the OSSs may include break rooms, bathrooms, locker facilities, and general storage rooms for staff and equipment. There will not be any running water facilities on the platform and wastewater will be collected in holding tanks and removed from the OSS by transfer to a crew transfer vessel (CTV) or services operations vessel (SOV). Solid waste will also be removed by a CTV or an SOV and brought to shore for proper disposal.

Each of the OSSs will require various oils, fuels, and lubricants to support its operation; SF_6 will also be used for insulation purposes. Table 2-7 provides a summary of the maximum potential quantities of oils, fuels, lubricants and SF_6 per OSS. The spill containment strategy for each OSS is comprised of preventive, detective, and containment measures. The OSSs will be designed with a minimum of 110 percent of secondary containment of all identified oils, grease, and lubricants. Additionally, OSS devices containing SF_6 will be equipped with integral low-pressure detectors to detect SF_6 gas leakages should they occur.

Table 2-7 Summary of Maximum Potential Quantities Oils, Fuels, Lubricants, and SF6 per OSS

OSS Equipment	Oil/Fuel/Lubricant/Gas Type	Maximum Quantity per OSS
Transformers and Reactors	Transformer Oil	79,252 gal (300,000 L)
Generators	Diesel Fuel	52,834 gal (20,000 L)
Medium and High-Voltage Gas-insulated Switchgears	SF6	40 lbs (18 kg)
Crane	Hydraulic Oil	317 gal (1,200 L)

Appropriate safety systems will be included on the OSSs, including fire alarm and fire suppression systems, first aid and lifesaving equipment, emergency power supply, and lightning protection. The OSSs will not be manned; however, once functional, the OSSs will be subject to periodic O&M. Access to the OSSs will be provided from a boat landing or alternative means of safe access and potentially a helideck. The boat landing located at the OSS substructure provides access to the cable deck via a staircase and an intruder cage, to prevent unauthorized access to the OSSs. In case of emergency on the OSS, the platform can be abandoned by means of life rafts. There will be an emergency room on the platform to house O&M staff in case of inclement weather.

The OSSs will be lit and marked in accordance with FAA and USCG requirements for aviation and navigation obstruction lighting, respectively. The lights will be equipped with back-up battery power, as well as an emergency power supply, to maintain operation should a power outage occur on an OSS.

The permanent genset installed on the OSS will be used under both emergency and non-emergency conditions. During the construction phase, power to the OSS will be provided by the jack-up installation vessel. During OSS commissioning (part of the construction phase), if the connection to the grid has not been established, the permanent genset may operate to power the OSS until the grid connection is established. During the operations phase, the OSS genset may be required to operate in emergency situations where grid power is unavailable and may be used occasionally to provide power during routine maintenance of the OSS (if grid power is unavailable or the maintenance being performed requires disconnection from the grid).

A summary of the OSS routine maintenance activities and the indicative frequency at which they may occur is provided in Table 2-8. Routine maintenance requirements and frequencies are subject to change based on final design specifications and manufacturer requirements.

Table 2-8 Routine OSS Maintenance Frequency

Maintenance/Survey Activity	Indicative Frequency
Routine service of electrical components	20 per year
Electrical inspections	2 per year
Scheduled maintenance of OSS components	Annual
Minor corrective and preventative maintenance of OSS equipment	5 per year
Major corrective and preventative maintenance of OSS equipment	2 per lifetime

2.2.4. WTGs

Each WTG will have its own control system to carry out functions like yaw control and ramp down in high wind speeds. Each turbine will also connect to a central SCADA system for control of the wind farm remotely. This allows functions such as remote turbine shutdown if faults occur. The Project will be able to shut down a WTG within two minutes of initiating a shutdown signal. A summary of WTG maintenance activities and the maximum frequency at which they may occur is provided in Table 2-9. Maintenance requirements (including frequencies) referenced in this table areused to support analyses in this application and are subject to change based on final design specifications and manufacturer requirements. Detailed information regarding maintenance and required frequencies will be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction. WTGs will be continuously remotely monitored via the SCADA systems from shore.

Table 2-9 WTG Maintenance Frequency

Maintenance/Survey Activity	Indicative Frequency
Routine Service & Safety Surveys/Checks	Annual
Oil and HV Maintenance	Annual
Visual Blade Inspections (Internal and External)	Annual

Fault Rectification	As needed
Major Replacements	As needed
End of Warranty Inspections	At end of warranty period

Preventative maintenance activities will be planned for periods of low wind and good weather (typically corresponding to the spring and summer seasons), mostly during daylight hours. The WTGs will remain operational at night between work periods of the maintenance crews.

Certain O&M activities may require presence of either a jack-up vessel or anchored barge vessel. These activities will result in a short-term disturbance of the seabed similar to or less than what is anticipated.

2.2.5. O&M Vessels and Equipment

Table 2-10 summarizes the anticipated annual vessel activity during the O&M period. On average, there will be approximately three vessel trips per day during the Project's operational period. It is important to note that the engine sizes and durations of activities used in this air permit application reflect most current Project design to the best of Revolution Wind's knowledge at the time of submission, but because Revolution Wind is still selecting contractors and finalizing the design its facilities, Project details may change after the submission of this application.

Table 2-10 Description of Vessels and Equipment Used During Operations and Maintenance

O&M Activity	Vessel/Equipment Type	Annual Round Trip
Unplanned WTG/OSS O&M		
Crew transport	Crew Transfer Vessel	1
Repair Vessel	Jack-up Vessel	1
Repairs power supply	Jack-up generators (100 kW and 7 kW)	NA
Repairs equipment	Cherry picker (10 kW)	NA
Cable Inspection/Repairs		
IAC, OSS-link and RWEC Inspection/Repair	Survey Vessel	<1
Daily O&M		
Crew transport	Crew Transport Vessel	180
Crew accommodation	Service Operations Vessel	19
Crew transport	SOV daughter craft	2
Crew accommodation	SOV generator (530 kW)	NA

It is possible that the Project's offshore facilities will require a major repair during the Project's 20- to 35-year lifespan. A major repair to the WTGs or OSSs would closely resemble the process of installing the WTGs and OSSs. Emission sources during a major repair would be the same as those used for routine O&M, but more vessels would be at the WDA for a longer period. Consequently, potential air emissions during a year in which a major repair occurs would exceed annual emissions during routine O&M. Because of the infrequent and uncertain nature of a major repair, Revolution Wind is not including emissions associated with major repairs in this permit application. Should such an event occur in future years, Revolution Wind would seek the appropriate regulatory guidance and approvals at that time.

3. AIR EMISSIONS SOURCES

Air emissions associated with construction and O&M of the Project depend on many factors, such as location, scope, type, and capacity of equipment and schedule. Primary emission sources associated with the Project will be from engine exhaust of marine vessel traffic, heavy equipment, and onshore vehicles during construction. In general, most criteria pollutant emissions will be from internal combustion engines (ICEs) burning diesel fuel (and sometimes gasoline) and will include primarily nitrogen oxides (NO_X) and carbon monoxide (CO), lesser amounts of volatile organic compounds (VOCs) and particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) – mostly in the form of particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), and even lesser amounts of sulfur oxides (SO_X).

This air permit application considers emissions of OCS sources associated with the Project. These emissions are defined pursuant to 40 CFR 55 as emissions from OCS sources, which includes certain vessels while attached to the seabed or to the Project, and certain vessels traveling to and from the project site when within 25 miles (40.2 km) of the project center (the 25-mile [40.2 km] centroid or the OCS centroid).

3.1. OCS Sources

The OCS sources for this project were determined based on the OCS air regulations contained in 40 CFR 55. Section 55.2 entitled "Definitions" include the definition of an OCS source as follows:

OCS source means any equipment, activity, or facilities which:

1) *Emits or has the potential to emit any air pollutant.*
2) *Is regulated or authorized under the Outer Continental Shelf Lands Act ("OCSLA") (43 U.S.C Section 1331, et. Seq.).*
3) *Is located on the OCS or in or on waters above the OCS.*

This definition shall include vessels only when they are:

1) *Permanently or temporarily attached to the seabed and erected thereon and used for the purposes of exploring, developing, or producing resources (therefrom, within the meaning of Section 4(a)(1) of OCSLA (43 U.S.C Section 1331, et, seq.).*
2) *Physically attached to an OCS facility, in which case only the stationary source aspects of the vessels will be regulated.*

The OCS area to be used for air permitting are drawn based on the definitions included in the 40 CFR 55. Under 55.3(b) the rules indicate that source located within 25 miles of a States' seaward boundaries are subject to all the requirements of the COA as included in 55.14 and all federal requirements as designated in 55.13. All OCS sources for this project are located within 25 miles of a States' seaward boundaries thus the COA's state rules apply as well as the federal rules.

To determine the type of permitting needed, the potential emissions for the OCS source must be estimated. The definition of Potential Emissions is included in 40 CFR 55.3 as follows:

Potential emissions mean the maximum emissions of a pollutant from an OCS source operating at its design capacity. Any physical or operational limitation on the capacity of a source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as a limit on the design capacity of the source if the limitation is federally enforceable. Pursuant to section 328 of the Act, emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while enroute to or from the source *when within 25 miles of the source and shall be included in the "potential to emit" for an OCS source.*

Potential emissions resulting from the Project fall into two broad categories: 1) direct emissions from the OCS source(s) when regulated as a stationary source and 2) emissions included in the potential emissions of the OCS source.

Emissions in the first category occur only during the time when a piece of equipment, an activity, or facility (which may include a vessel) meets the definition of an OCS source. Emissions in this category will be subject to specific emission limits of the OCS permit and to federal regulations governing stationary sources including New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP).

Emissions in the second category include all potential emissions associated with the Project, including emissions from vessels while enroute to and from an OCS source when within 25 nm of the OCS source . Emissions in this category are utilized when:

1. Determining applicability of Clean Air Act (CAA) permit programs (Non-Attainment New Source Review [NNSR], Prevention of Significant Deterioration [PSD], and CAA Title V operating permits);
2. Calculating number of nitrogen oxides (NOx) and volatile organic compounds (VOC) offsets required due to emissions if the Project is subject to NNSR permitting for one or both pollutants;
3. Modeling potential impact of Project on Class I areas and ambient air, as applicable.

3.2. Revolution Wind OCS Sources

The OCS sources for this permit application were determined based on the OCS air regulations contained in 40 CFR 55.2, as described in Section 2.1. For the Revolution Wind Project, jack-up vessels, vessels that anchor, vessels that tether to an OCS source, and generators installed on an OCS source will each meet the definition of an OCS source. These three types of vessels and anticipated generators are discussed more below.

3.2.1. Temporary Construction Sources

The majority of emissions from the Project will come from the propulsion engines, auxiliary engines, and equipment on vessels used during construction activities. Emissions from marine vessel engines will also occur while vessels maneuver within the OCS area, during installation of the offshore export cables, and during vessel transit to and from port.

3.2.2. Jack-up Vessels

Jack-up vessels are self-propelled or non-self- propelled vessels with legs that extend to the ocean floor and a hull that elevates to provide a safe, stable working platform. As described in EPA's Fact Sheet for South Fork Wind, a jack-up vessel only becomes an OCS source when at least three of its legs attach to the OCS. Any propulsion or auxiliary engine that is operational while the vessel is attached to the seabed is an OCS source. Any air-polluting equipment (e.g., pile driving hammer engines, air compressors, etc.) that operate on a jack-up vessel while three of its legs are attached to the seafloor will also be considered OCS sources. All jack-up vessels used by the Project will be supplied by third-party vendors.

3.2.3. Anchored Vessels

Some vessels used during the Project may anchor to the seabed while in waters above the OCS. These vessels become OCS sources once an anchor is placed on the seabed within the Project Area, and the vessel is performing any activity that supports the construction or operation of the project. All vessels that anchor while performing activities that support the construction and operation of the Project are expected to be supplied by third-party contractors. Within the RWF Lease Area, anchored vessels will not be used as primary construction and installation vessels. Most vessels used for construction and installation will use dynamic positioning systems (DPS), which will not meet the definition of an OCS source. A few third-party crew transfer vessels and safety vessels are expected to use anchors in support of the construction. During O&M, crew transfer vessels and an SOV daughter craft may anchor and/or moor. Other vessels might anchor while idle and not performing activities supporting construction/operation, but these vessels would not be considered OCS sources. Any air-polluting equipment (e.g. pile driving hammer engines, air compressors, etc.) that operate on anchored vessels will also be considered OCS sources.

3.2.4. Tethered Vessels

Some vessels used during the Project may attach to an OCS facility such as the OSSs or jack-up vessels. Because an OCS facility is defined as a facility which emits or has the potential to emit any air pollutant, it is determined that the OSSs are OCS facilities since they will have the potential to emit via installed generators. Different than earlier-permitted wind farms in the WDA, no generators will be installed on the RWF WTGs. Although WTGs were considered OCS facilities for other wind farms, EPA's Fact Sheet for Vineyard Wind Farm presents the permanently installed diesel-fired generators as justification for OCS source classification. Because RWF WTGs will not have any installed generators, the application does not consider vessels tethered to WTGs as OCS sources, or vessels servicing or associated exclusively with the installation, commissioning, or maintenance of the WTGs. Only vessels tethered to OSSs will be OCS sources.

For vessels tethered to an OSS, only the stationary sources aspects of these vessels are regulated. The emissions from those vessels servicing or associated with the OSSs will also be included in the PTE when within 25 nm of the centroid. Any air-polluting equipment (e.g. engines providing power to pile driving hammers or cranes) that operate on vessels while those vessels are tethered to an OCS facility will also be considered OCS sources.

Note that ongoing discussions are occurring between Orsted and EPA regarding the applicability of WTGs as OCS sources. Appendix A presents a justification for excluding the WTGs from the definition of an OCS source. To be conservative, this application does not attempt to discern those vessel emissions that would tether to an OSS versus those that would tether to a WTG. Therefore, the PTE presented in this application is conservative. It is expected that based on the outcome of discussions with EPA regarding Appendix A, an amendment to this application will be submitted to present a refined PTE if needed.

3.2.5. OSS Generators

An approximately 600 kW diesel generator will be installed on each OSS during commissioning and during O&M. These generators will be used if shore power is not available from the RWEC, and if the WTGs are not providing power to the OSSs. Testing of the emergency generators will occur for approximately 1 hour per week. During WTG or OSS repair procedures, it is expected that a power source may be required for various purposes such as to operate power tools. Additional use of the OSS generators for routine maintenance power if the power grid is not available. It is assumed that total operation of each OSS generator will be 200 hours per year under non-emergency conditions.

The engine sizes and durations of activities used in this air permit application reflect most current Project design to the best of Revolution Wind's knowledge at the time of submission, but because Revolution Wind is still selecting contractors and finalizing the design its facilities, certain engine sizes and other Project details may change after the submission of this application. Revolution Wind will not know exactly which third-party engines will be used until much closer to the start of construction and operation because construction and repair plans change on short notice, the market demand for vessels is huge, and the Jones Act imposes limitations on available vessels. For these reasons, vessels may also be changed out after construction begins.

3.3. Potential to Emit

"Potential to emit" is defined as the maximum capacity of a source to emit a pollutant under its physical and operational design. See 40 CFR § 52.21(b)(4). In the case of "potential emissions" from OCS sources, 40 CFR Part 55 defines the term similarly and provides that:

"Pursuant to section 328 of the Act, emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while en route to or from the source when within 25 miles of the source and shall be included in the "potential to emit" for an OCS source. This definition does not alter or affect the use of this term for any other purposes under 40 CFR §§ 55.13 or 55.14 of this part, except that vessel emissions must be included in the "potential to emit" as used in 40 CFR §§ 55.13 or 55.14 of this part." (40 CFR § 55.2)

Thus, emissions from vessels servicing or associated with an OCS source that are within 25 miles of the OCS source are considered in determining the potential to emit or "potential emissions" of the OCS source, regardless of whether the vessel meets the definition of an OCS source. For example, emissions from vessels that transport crews and equipment to an OCS source (e.g. an OSS or jack-up vessel) but do not attach to the OCS must be included in the potential to emit (PTE). This definition of PTE applies to the federal, state, and local regulations listed in 40 CFR Parts 55.13 and 55.14, even though the definition of PTE provided in these federal, state, and local regulations typically does not include emissions from mobile sources.

It is possible that certain construction emissions may occur prior to the establishment of an OCS source (e.g. emissions from the installation of the scour protection). While the OCS regulations do not require the inclusion of these emissions in the PTE, Revolution Wind is including these emissions in order to provide a conservative estimate of potential emissions.

Vessels used to transport components of the offshore facilities from Europe to a US port are not included in the estimate of potential emissions because those vessels would not be "at the source" or "enroute to or from the source."

Most construction equipment and nearly all vessels used for the Revolution Wind Project will be supplied by contractors. Therefore, it is impossible to know precisely which pieces of equipment and vessels will be used for the Project at this point in time. Revolution Wind used representative equipment to develop emission calculations. Even if the exact specifications of the third-party engines could be known in advance, the maximum emissions of construction equipment and vessels operating at their design capacity for 24 hours/day, 365 days/year (i.e., absent any federally enforceable physical or operational requirements) would far exceed (and not be representative of) the emissions associated with the actual construction and operation of the Project. Therefore, the Project is requesting federally enforceable limitations on the total emissions from the Project's construction activities and O&M activities.

3.4. Pollutants

EPA has developed National Ambient Air Quality Standards ("NAAQS") for six air contaminants, known as criteria pollutants, for the protection of public health and welfare: sulfur dioxide (SO2); particulate matter (smaller than 10 microns as PM_{10}, smaller than 2.5 microns as PM2.5); nitrogen dioxide (NO2); carbon monoxide (CO); ozone (O3); and lead (Pb). Typically, ozone is not emitted directly into the air; instead, ozone primarily forms from the reaction of volatile organic compounds (VOC) and nitrogen oxides (NOx) in sunlight. VOC and NOx, which are often emitted directly into the air, are commonly referred to as ozone precursors. Therefore, emissions of the precursors to ozone are quantified instead of ozone. The following pollutants are included in the air emissions analysis:

- Nitrogen oxides (NO_X)
- Volatile organic compounds (VOC)

- Carbon monoxide (CO)
- Particulate matter smaller than 10 microns (PM_{10})
- Particulate matter smaller than 2.5 microns ($PM_{2.5}$, a subset of PM_{10})
- Sulfur dioxide (SO_2)
- Sulfuric Acid Mist (H_2SO_4)
- Lead (Pb)
- Total hazardous air pollutants (HAPs, individual compounds are either VOC or particulate matter)
- Greenhouse gas emissions as carbon dioxide equivalent (CO2e)a

4. EMISSIONS ESTIMATES

The following section describes the methodology used to calculate air emissions from the Project. The operation of the wind turbines will not emit contaminants, but there are emissions associated with installation of the turbines and other activities associated with construction and O&M of the Project. Emissions have been estimated for construction and O&M.

Air emission estimates in the OCS Air Permit application must include air emissions from OCS sources, certain vessels while attached to the seabed or to the Project, and certain vessels traveling to and from the RWF when within 25 nm of the RWF centroid.

Project-related aircraft, vessel, vehicle, and equipment usage will generate emissions offshore predominantly during the 12 to 18-month construction phase. This analysis presumes that onshore construction could occur as quickly as one year to be conservative. During the 20-to-35-year estimated O&M phase, the RWF will generate few emissions from infrequent use of equipment engines, vessels, and vehicles. O&M activities will produce relatively little emissions compared to those produced during construction. Emissions from decommissioning are estimated to be a percentage of construction-phase emissions – though similar construction activities will be conducted to decommission Project components; the activity will be of a much shorter duration. However, decommissioning activities would occur 20-to-35 years in the future when combustion energy and pollution control technologies will be improved, so it is speculative to predict emissions. Therefore, a separate OCS air permit application will be submitted for decommissioning prior to the conclusion of the operational period.

4.1. Vessels

The BOEM Offshore Wind Energy Facilities Emission Estimating Tool (BOEM Wind Tool) was developed to provide consistent sets of air quality emission factors for proponents preparing OCS air emissions inventories. The BOEM Offshore Wind Energy Facilities Emission Estimating Tool Technical Documentation (herein referred to as the Documentation) provides a summary of the emission factors, and emission estimating methods, which were used in the independently developed air emissions estimations presented herein.

Consistent with the Documentation, vessel air emissions were calculated based on marine vessels' hours of operation at the RWF, distance traveled, speed, total number of trips, engine size, load factor, and marine vessel specific emission factor. For each marine vessel, the following calculations were made:

- Emissions from the main and auxiliary engines while in transit; and
- Emissions from the main and auxiliary engines while maneuvering.

The general equation for calculating the emissions from a marine vessel is:

Marine Vessel Emissions (tons) = [Main Engine Power Rating (kW) x Load Factor x Activity Hours (hours) x Emission Factor (g/kW-hour) x (1 lb /454 g) x (1 ton / 2000 lb) x (# of Sources)]

+ [Auxiliary Engine Power Rating (kW) x Load Factor x Activity Hours (hours) x Emission Factor (g/kW hour) x (1 lb /454 g) x (1 ton / 2000 lb) x (# of Sources)]

The Documentation contains default vessel characteristics for a variety of marine vessels commonly used in offshore wind projects. For each vessel type, the Documentation provides default emission factors for main and auxiliary engines. In most cases, default emission factors for main and auxiliary engines of each vessel type were utilized in this assessment.

Some of the specific vessels to be used have been identified by Revolution Wind. For those that are large contributors to NOx emissions due to time spent in RWF, or those that will be involved in daily O&M, vessel-specific NOx emission factors were used based on the vessels' tier rating. All other pollutants used default emission factors following the Documentation.

Vessel emission estimates are based on actual vessels that may be used for the Project or are closely representative of the type of vessel that will be used for the Project. Engine sizes and vessel speeds are from equipment specification sheets for each representative vessel. However, several vessel specifications sheets did not specify the size of the main and/or auxiliary engines or differentiate between auxiliary engines and main engines. When no engine size information was provided, main and auxiliary engine sizes were determined using defaults provided in the Documentation. When only the size of the main engine was provided, auxiliary engine sizes were determined using default auxiliary engine sizes provided in the Documentation. For most vessels, the number of round trips to and from port, or transit hours, was provided by Revolution Wind as representative of expected operations.

Load factors are expressed as a percent of the vessel's total propulsion or auxiliary power. The Documentation provides a default load factor of 0.82 for main engines in transit, which was used in our emission estimates. Consistent with the Documentation, a load factor of 0.20 was used for main (propulsion) engines while maneuvering onsite. While onsite, most vessels are expected to use dynamic positioning to maintain their location. However, jack-up vessels and the like, will plant their legs on the seafloor to maintain their position. Since these vessels' main engines will not operate while their legs are resting on the seafloor, a load factor of zero was used in for those emission estimates.

4.1.1. Generators

Electric generators will be used during the Project's construction phase and O&M phase. During installation and commissioning, there will be 597 kW emergency generators installed on each OSS. It is estimated that each generator may operate up to 2,400 hours during installation and commissioning. Two 156 kW temporary generators will also be installed on each OSS during installation and commissioning. It is estimated that each generator will operate for 4,380 hours.

The cable laying vessel will use three generators for performing the cable pull-ahead activity. One such generator is expected to be 37 kW and is estimated to operate for 600 hours. The other two generators will be 75 kW and each are expected to operate for 120 hours.

The commissioning of each WTG will require a source of power. The WTGs will be powered by an integrated battery backup system and are not anticipated to require the use of a generator. However, in the unlikely scenario that there is not enough wind to charge the battery back-up system ahead of commissioning, 37 kW on-vessel generators will be used to temporarily power the WTG for commissioning.

The 597 kW OSS generators will remain on the OSSs during the O&M phase and will be used occasionally for emergency conditions. Because the generators will be primarily used for emergency conditions, the number of hours for emergency operations has not been estimated. Additional use of the OSS generators for routine maintenance power if the power grid is not available. It is assumed that total operation of each OSS generator will be 200 hours per year under non-emergency conditions.

The Documentation provides default emission factors for EPA Tier 3 electric generators, which were utilized in this assessment. The general equation for calculating the emissions from offshore electric generation is:

Generator Emissions (tons) = Engine Power Rating (kW) x Activity Hours (hours) x Emission Factor (g/kW-hour) x (1 lb /454 g) x (1 ton / 2000 lb) x (# of Sources)

4.1.2. Equipment

Emissions from on-vessel equipment were estimated using EPA's Federal Nonroad compression ignition engine emission factors, while hazardous emission factors were estimated using AP-42 Section 3.3 emission factors. Details of the emission factors used are presented in Appendix C.

4.2. OCS Air Permit Potential to Emit

The construction emission estimates shown in Table 4-1 and 4-2 and Appendix C are estimated for the 25 nm OCS area.

For the purposes of determining potential emissions, EPA has determined that it is appropriate to use the center of the source as the point to estimate vessel emissions within 25 nautical miles of the facility. Within this application, the centroid of RWF was determined by finding the average of the proposed WTG locations. However, this approach conservatively assumes that the WTGs meet the definition of an OCS source during the construction, commissioning and O&M of the Project. In Appendix A, Revolution Wind presents a justification for excluding the WTGs from the source determination for the Project. Depending on the outcome of discussions with Region 1 related to the source determination and Appendix A, Revolution Wind may submit an amendment to this application which would present the potential to emit (PTE) with the WTGs not included as OCS sources. Therefore, as an initial conservative approach, all vessel emissions within 25 nautical miles of the centroid (as determined by proposed WTG locations) were used for determining the potential emissions for this application.

Emission estimates completed over a one-year period to estimate worst case emissions. For the operations and maintenance phase estimates, the emissions are presented as tons per year of contaminant, based on the number of trips and usage expected over one year of RWF O&M.

Emissions of greenhouse gases from marine vessels were estimated using the methodology described above for criteria air pollutants and their precursors. Greenhouse gas emissions as carbon dioxide equivalent (CO_2e) were then calculated using global warming potential (GWP) factors provided in the Documentation. The GWP factors are 1 for CO_2, 28 for CH_4 and 265 for N_2O. Total CO_2e is the sum of each greenhouse gas emission estimate multiplied by its corresponding GWP.

Table 4-1 Construction OCS Emissions

Applicable OCS Air Permit Construction Emissions (tpy)										
CO2	CH4	N2O	CO2e	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	VOC	Pb
260,649	2	12	263,765	897	3,377	13	116	113	73	0

Table 4-2 O&M OCS Emissions

Applicable OCS Air Permit O&M Emissions (tpy)										
CO2	CH4	N2O	CO2e	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	VOC	Pb
15,400	0.1	0.7	15,598	5.6	168.4	0.7	7.1	6.9	4.2	0

5. APPLICABLE REGULATORY REQUIREMENTS

40 CFR 55.6(a)(1)(ii) requires that the OCS source permit application includes a description of how the source will comply with the applicable requirements. This section summarizes each applicable federal requirement and lists the applicability of each Massachusetts state requirement for the Project.

5.1. Federal Requirements

This section includes a summary of the federal air regulations listed as potentially applicable to OCS sources as per 40 CFR 55.13. The potentially applicable regulations are summarized in Table 5-1. Table 5-1 includes the regulatory citation, a brief description of the regulation and the applicability criteria of each regulation to the Project.

Table 5-1 Summary of Federal Regulations Potentially Applicable to Project

Citation	Title	Description	Applicability
40 CFR 52.21	Prevention of Significant Deterioration (PSD) program	Major new stationary sources or major modifications to an existing major source within an air quality attainment area must undergo a PSD review and obtain all applicable federal and state preconstruction permits prior to commencement of construction (delegated to Massachusetts Department of Environmental Protection [MassDEP] by EPA). A major source under PSD regulations is defined as any source type in any of 28 designated industrial source categories having potential emissions of 100 tons per year or more, or any other source having potential emissions of 250 tons per year or more of any regulated pollutant. The pollutants that will require a PSD review are determined by comparing potential emissions to pollutant-specific significant emission rates.	The Project source types does not fall under the 28 designated industrial source categories. The Project is applicable because the Project's emissions are above 250 tons per year of NO_2 and CO. The applicable pollutants are NO_2, CO, PM_{10}, $PM_{2.5}$, VOC, and GHGs, since the potential emissions exceed the pollutant's significant emission rates.
40 CFR 52.10, 52.24, 51 and Appendix S	Federal New Source Review Program	These sections provide guidance on new source review program in absence of a state program. Massachusetts had a new source review program under 310 Code of Massachusetts Regulations (CMR) 7.00 Appendix A which has been approved by EPA.	Applicable because the Project's emissions are above NSR thresholds for NO_X and VOC emissions triggering nonattainment new source review (NNSR).
40 CFR 60	New Source Performance Standards (NSPS)	These sections provide standards for new sources in specified categories.	The two NSPS applicable to this project are 40 CFR 60 Subpart IIII - "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" and 40 CFR 60 Subpart JJJJ – "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines."

40 CFR 61	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	Establishes NESHAPs in specified source categories.	Not applicable because Project has no sources within the source categories specified.
40 CFR 63	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	Establishes NESHAPs in specified source categories.	The only NESHAP applicable to this project is 40 CFR 63 Subpart ZZZZ - "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines."
40 CFR 71	Federal Operating Permit Program	This is applicable to major stationary sources and has been delegated to MassDEP by EPA. MassDEP implements this program under 310 CMR 7.00 Appendix C.	Applicable because the Project's emissions are above major source thresholds. A Title V Operating Permit will be obtained for operation of the project.
40 CFR 1039	Control of Emissions from New and In-use Nonroad Compression-Ignition Engines	Establishes emissions standards for nonroad diesel engines	Applicable because of the projects use of generator sets for construction, operation, and maintenance.
40 CFR 1042	Control of Emissions from New and In-use Marine Compression-Ignition Engines and Vessels	Establishes emissions standards for marine diesel engines	Applicable because of the projects use of marine vessels for construction, operation, and maintenance.

Note: Includes only federal requirements listed as applicable to OCS sources as per 40 CFR 55.13

5.1.1. Prevention of Significant Deterioration

The Prevention of Significant Deterioration (PSD) regulations promulgated under 40 CFR 52.21, as amended by the EPA in 2003, specify that major new stationary sources or major modifications to an existing major source within an air quality attainment area must undergo a PSD review and obtain all applicable federal and state preconstruction permits prior to commencement of construction.

A major source, under PSD regulations, is defined as any source type in any of 28 designated industrial source categories having potential emissions of 100 tons per year or more, or any other source having potential emissions of 250 tons per year or more of any regulated pollutant.

In addition, since the Project will be located in an ozone nonattainment area, both NO_X and VOC (ozone precursors) emissions would have to be evaluated under the NNSR program (rather than the PSD Program). However, Massachusetts is in attainment for NO_2, so NO_2 is considered an attainment pollutant in this evaluation. Thus, if the project is estimated to emit more than 250 tpy of the following attainment pollutants: NO_2, sulfur dioxide (SO_2), particulate matter (PM), and CO, it will be subject to the PSD program.

PSD permitting for greenhouse gases is only evaluated if emissions from another PSD pollutant triggers PSD permitting.

PSD permitting generally consists of:

- A case-by-case BACT demonstration, taking into account energy, environmental and economic impacts, as well as technical feasibility
- An ambient air quality analysis to determine whether the allowable emissions from the proposed source, in conjunction with all other applicable emission increases or reductions, would cause or contribute to a violation of the applicable PSD increments or NAAQS
- An assessment of the direct and indirect effects of the proposed source on industrial growth in the area, soil, vegetation, and visibility
- Public comment, including an opportunity for a public hearing

Massachusetts was delegated the PSD program on behalf of EPA until 2003. In 2003, Massachusetts returned the management of the PSD program back to EPA. In April 2011, EPA once again delegated the PSD program back to Massachusetts.

Table 5-2 illustrates the estimated emissions associated with this project, compared to the PSD thresholds for each attainment criteria pollutant that would be expected from the Project.

In this evaluation, though the Project is not included in any of the 28 source categories, it is considered a major PSD source because its worst-case potential emissions of NO_X exceed 250 tons per year, as presented in Table 5-2. Because the source is major for NO_X, all other criteria attainment air pollutants must be compared with their associated Significant Emission Rate to determine if PSD permitting is triggered for other pollutants as well. As a result of this analysis, this Project is subject to PSD preconstruction review permitting for NO_X, CO, PM_{10}, $PM_{2.5}$, VOCs and GHGs, because the potential emissions exceed the respective Significant Emission Rate. Note that Revolution Wind and EPA are engaged in ongoing discussions regarding source determinations for the Project. A justification for excluding the WTGs from the source determination is presented in Appendix A. Based on the outcome of EPA's response to Appendix A, Revolution Wind may submit an amendment to this application, which may determine a different applicability than what is outlined in Table 5-2. The air quality modeling and additional impacts analysis for these PSD pollutants continue to be discussed with EPA Region 1 and will be provided in a supplemental report.

Table 5-2 Worst Case Year Annual Emissions Estimates Compared with PSD Thresholds

Pollutant	Estimated Worst Case Annual Emissions (tpy)	Significant Emission Rate (tpy)	PSD Triggered?
NO_X[1]	3,377	40	Yes
CO	897	100	Yes
PM_{10}	116	15	Yes
$PM_{2.5}$	113	10	Yes

SO_2	13	40	No
VOC	73	40	Yes
Lead	0	0.6	No
GHG as CO_{2e} [2]	263,765	75,000	Yes
Sulfuric Acid Mist	None expected	7	No
Hydrogen sulfide (H2S)	None expected	10	No
Total Reduced Sulfur	None expected	10	No
Reduced Sulfur Compounds	None expected	10	No

Notes:

- NO_2 is the compound regulated as a criteria pollutant; however, significant emissions are based on the sum of all oxides of nitrogen.
- CO_2 threshold only applies if PSD is triggered for another PSD pollutant.

5.1.2. Non-attainment New Source Review

The NNSR regulations promulgated under 40 CFR 51 specify that major new stationary sources or major modifications to an existing major source within an air quality non-attainment area must undergo a NNSR review and obtain all applicable federal and state preconstruction permits prior to commencement of construction.

NNSR permitting generally consists of:

- A LAER analysis and the installation of equipment that can achieve LAER
- Purchase of emission offsets to offset emissions of the non-attainment air pollutant
- Public comment, including an opportunity for a public hearing

The NNSR program requires a LAER review, rather than a BACT analysis (as required for PSD). Before operation can begin, the source must obtain emission reductions (offsets) of the non-attainment pollutant from other sources that impact the same area as the proposed source. In addition, the applicant must certify that all other sources owned by the applicant in the State are complying with all applicable requirements of the Clean Air Act (CAA), including all applicable requirements of the State Implementation Plan (SIP).

The major source threshold for a new NNSR source is 50 tpy of NO_X or 50 tpy of VOC emissions. This program is implemented under 310 CMR 7.00 Appendix A in Massachusetts.

Table 5-3 illustrates the maximum estimated annual emissions associated with the Project's OCS area, compared to the NNSR thresholds for NO_X and VOCs that would be expected from the Project. These maximum annual emissions would occur during construction and would be temporary in nature. In this evaluation, the Project would be considered a new source. The Project's NO_X and VOC emissions are expected to exceed major source thresholds and therefore will trigger NNSR permitting for NO_X and VOC.

Table 5-3 Maximum Annual Emissions Estimates Compared with NNSR Thresholds

Pollutant	Estimated Maximum Annual Emissions (tpy)	NNSR Threshold (tpy)	NNSR Triggered?
NO_X	3,377	50	Yes
VOC	73	50	Yes

5.2. State Requirements

This section includes a summary of each Massachusetts regulation that is listed as potentially applicable to OCS sources per 40 CFR 55.13. Each potentially applicable regulation is summarized in Table 5-4. Table 5-4 includes the regulatory citation, a brief description of the regulation and whether the regulation would be applicable to the Project. This list is current as of the “Outer Continental Shelf Air Regulations: Consistency Update for Massachusetts” published on November 23, 2021, in the Federal Register (86 FR 66509).

Table 5-4 Potentially Applicable Regulations

Citation	Title	Description	Applicability
310 CMR 4.00	Timely Action Schedule and Fee Provision	Establishes administrative procedures, such as fees, permit application processing schedules for Massachusetts permits.	This section will be generally applicable; however, there are no specific "actionable" requirements to be included in the OCS air permit.
310 CMR 6.00	Ambient Air Quality Standards for the Commonwealth of Massachusetts	Establishes primary and secondary air quality requirements in Massachusetts that are compared with for air dispersion modeling.	Revolution Wind will conduct air dispersion modeling for this project as detailed in Section 7.0.
310 CMR 7.00	Air Pollution Control, Preamble, Definitions	General Administrative Provisions & Definitions	This section will be generally applicable; however, there are no specific "actionable" requirements to be included in the OCS air permit.
310 CMR 7.01	General Regulation to Prevent Air Pollution	Prohibits operators of emissions sources from willfully causing a condition of air pollution.	This section will be generally applicable; however, there are no specific "actionable" requirements to be included in the OCS air permit.
310 CMR 7.02	Plan Approval and Emission Limitations	A plan approval is required prior to any construction, substantial reconstruction, alteration, or subsequent operation of a facility that may emit contaminants to the ambient air.	The Project will be subject to a major Comprehensive Plan Approval as per 310 CMR 7.02(5) because it triggers NNSR & PSD permitting.

310 CMR 7.03	Plan Approval Exemption: Construction Requirements	"Permit by rule" section of the regulations that exempts certain sources from plan approval by meeting specific design and/or operating requirements.	Not applicable, no sources associated with the Project are an exempt source under 310 CMR 7.03.
310 CMR 7.04	Fossil Fuel Utilization Facilities	Establishes monitoring and testing requirements for fossil fuel utilization facilities.	Not applicable, no sources associated with the Project are defined as a fossil fuel utilization facility.
310 CMR 7.05	Fuels All Districts	Establishes fuel sulfur limits	The project will use diesel fuel meeting these fuel sulfur limits for ultra-low sulfur diesel while the source meets the definition of an OCS source.
310 CMR 7.06	Visible Emissions	Establishes visible emission limits for stationary sources.	All engines used in the Project will meet the facility and opacity standards in 310 CMR 7.06 while operating as an OCS source.
310 CMR 7.07	Open Burning	Prohibits open burning.	Not applicable
310 CMR 7.08	Incinerators	Establishes operating practices, emission standards, and monitoring for incinerators.	Not applicable
310 CMR 7.09	Dust, Odor, Construction and Demolition	Prohibits dust or odor emission which cause or contribute to a condition of air pollution, including from construction or demolition of buildings.	Not applicable. The Project does not have dust or odor generating sources as part of the OCS portion of the project. There is no construction or demolition of buildings.
310 CMR 7.11	Transportation Media	Establishes requirements for motor vehicles, diesel trains, aircraft and marine vessels. Prohibits vessel, tube blowing or soot removal activities from marine vessels that cause or contribute to a condition of air pollution.	The Project will comply with this regulation by prohibiting tube blowing or soot removal activities that cause a condition of air pollution from the marine vessels used for this project.
310 CMR 7.12	Source Registration	Establishes air emission reporting requirements for facilities meeting certain criteria.	The Project will have to submit an annual source registration to MassDEP.
310 CMR 7.13	Stack Testing	Provides requirements for stack testing.	Not applicable; no stack testing will be required for this project.
310 CMR 7.14	Monitoring Devices and Reports	Establishes requirements for emission monitoring devices for specific stationary sources.	Not applicable; Project does not have a listed stationary source.
310 CMR 7.18	Volatile and Halogenated Organic Compounds	Establishes requirements for any facility that emits VOCs.	Project is only subject to general VOC requirements to minimize VOC emissions. Project may be subject to 7.18(30) – Adhesives and Sealants.

310 CMR 7.19	RACT for Sources of Oxides of Nitrogen	Establishes NO_X RACT requirements for any facility with a potential to emit, before air pollution control, of > 50 tpy of NO_X.	Not applicable since BACT/LAER emission limits will be more stringent.
310 CMR 7.24	Organic Material Storage and Distribution	Establishes requirements for the storage and distribution of organic materials and fuels.	Not applicable to the Project because there will be no fuel storage >40,000 gallons or motor vehicle fuel dispensing facility. Not applicable as Revolution Wind will not own, lease, operate, or control a marine terminal or marine tank vessel.
310 CMR 7.25	Best Available Controls for Consumer and Commercial Products	Establishes VOC requirements for certain consumer and commercial products.	Not applicable to the Project because it will not use the specified materials.
310 CMR 7.26	Industry Performance Standards	Establishes performance standards for specified industries and sources, including emergency and non-emergency engines.	Not applicable because the engines used in the Project will be subject to NNSR and offsets, which exempts it from these regulations per 310 CMR 7.26(40)(b)2.
310 CMR 7.60	Severability	General requirement that establishes that each section of 310 CMR 7.00 should be construed as separate to the end that if any regulation or sentence, clause, or phrases are held invalid for any reason, the remainder of 310 CMR 7.00 shall continue in full force.	This section will be generally applicable; however, there are no specific "actionable" requirements to be included in the OCS air permit.
310 CMR 7.70 (Proposed)	Massachusetts CO Budget Trading Program	Establishes the Massachusetts CO Budget Trading Program.	Not applicable to the Project because there are no fossil fuel fired stationary boilers, combustion turbines, or combined cycle systems greater than 25 MWe.
310 CMR 7.71 (Proposed)	Reporting of Greenhouse Gas Emissions	Implements the reporting and verification requirement for statewide greenhouse gas emissions and to monitor and ensure compliance	The Project will have to submit an annual report of greenhouse gas emissions to MassDEP.
310 CMR 7.72 (Proposed)	Reducing Sulfur Hexafluoride Emissions from Gas-insulated Switchgear	Assists the Commonwealth in achieving the greenhouse gas emissions reduction goals adopted pursuant to M.G.L 6. c. 21N, § (3)(b) by reducing sulfur hexafluoride (SF_6) emissions	Not applicable, because the project will not employ switchgears.

310 CMR 7.00 Appendix A	Emission Offsets and Nonattainment Review	Establishes MA NNSR preconstruction review program for new major sources or major modifications in a non-attainment area. NO_X and VOCs are non-attainment pollutants in Massachusetts because the state is located in an ozone transport region. Major source thresholds are 50 tpy NO_X or 50 tpy VOCs. NNSR permitting triggers a LAER analysis and obtaining offsets for the project.	Applicable because the Project emissions will be above major source thresholds and NO_X and VOC offsets will be required to be purchased for permitting and operation of the project.
310 CMR 7.00 Appendix B	Emission Banking, Trading and Averaging	Establishes principles and procedures that can be used by facilities to comply with the requirements of 310 CMR 7.18, 310 CMR 7.19, and 310 CMR 7.00: Appendix A. 310 CMR 7.00: It contains provisions to allow emission averaging and provisions to allow for the creation and use of emission reduction credits to be "banked," used or traded among facilities	Applicable because the Project is required to obtain emission reduction credits for permitting and operation of the project.
310 CMR 7.00 Appendix C	Operating Permit and Compliance Program	Establishes the requirements for the Massachusetts major source operating permit program. It applies to any facility with federal potential emissions which equal or exceed the following: 50 tpy NO_X or VOC, 10 tpy of any individual HAP, 25 tpy of total HAPs, or 100 tpy of any other regulated pollutant.	Applicable because the Project emissions will be above major source thresholds, so a Title V Operating Permit will be needed for operation.
310 CMR 8.00	The Prevention and/or Abatement of Air Pollution Episode Criteria	Establishes criteria for Massachusetts to declare an Air Pollution Episode and requires sources emitting > 100 tpy of SO_2, NO_X, particulate matter (PM), CO, hydrocarbon, or any other source specified in writing by MassDEP to prepare a standby Emission Reduction Plan (ERP).	Only generally applicable, unless MassDEP requests that Revolution Wind prepare an ERP for the project.

5.2.1. Plan Approval

The Commonwealth of Massachusetts provides procedures and standards for the issuance of plan approvals and establishes emission limitations and/or restrictions for a new or modified source under 310 CMR 7.02. In general, a plan approval is required prior to any construction, substantial reconstruction, alteration, or subsequent operation of a facility that may emit contaminants to ambient air above specified threshold quantities. The facility must operate in compliance with the issued plan approval.

5.2.2. Emissions Offsets and Nonattainment Review

In accordance with 310 CMR 7.02(5)(a)7, a Major Comprehensive Plan Approval (CPA) is required where construction, substantial reconstruction, or alteration causes a facility to be subject to PSD (40 CFR Part 52.21) or emission offsets and non-attainment review-NNSR (310 CMR 7.00: Appendix A). Under 310 CMR 7.02(3)(j)4, the MassDEP has the discretion to issue the NNSR plan approval in conjunction with a 310 CMR 7.02 plan approval.

Massachusetts is within the Northeast Ozone Transport Region (OTR) and is designated an ozone nonattainment area; therefore, new, or modified sources of NO_X and/or VOC within the Commonwealth are potentially subject to NNSR. The NNSR program implemented by MassDEP incorporates the pre-reform version of the Federal NNSR regulations, which included a different basis for evaluating net emissions increases to determine if they are significant, among other provisions, when they were amended in 2003. MassDEP does not intend to adopt the reformed version of the regulations.

The NNSR regulations specify that new major stationary sources or major modifications to an existing major source within an air quality non-attainment area must undergo a NNSR review and obtain all applicable federal and state preconstruction permits prior to commencement of construction, i.e. an application for a plan approval must be submitted. The intent of the NNSR review and conditions listed in Appendix A of the MassDEP regulations are to ensure that the increased emissions from a new or modified source are controlled to the greatest degree possible; that more than equivalent offsetting emissions reductions (emission offsets) be obtained from existing sources; and that there will be reasonable further progress toward achievement of the NAAQS.

A major source under NNSR regulations is defined in 310 CMR 7.00: Appendix A as any stationary source of air pollutants, which emits or has federal potential emissions greater than or equal to either 100 tons per year or more of any regulated pollutant, or 50 tpy of VOC or NO_X.

A NNSR regulatory review generally consists of:

- A LAER emission rate demonstration, taking into account the most stringent emission limitation contained in any state SIP for such source or category of stationary source or the most stringent emission limitation achieved in practice for such class or category of stationary source. The LAER analysis is detailed in Section 6.

- A demonstration of reasonable further progress by obtaining sufficient offsetting emissions such that the total emissions from existing sources in the area, from new or modified sources which are not major stationary sources, and from the proposed source will be sufficiently less than the total emissions from existing sources prior to the application for the proposed source to represent reasonable further progress by the time the proposed modified source commences operation. EPA Region 1's approach to offsets as they relate to construction emissions recently changed as documented within the SFW Supplemental Fact Sheet, dated October 20, 2021. Section 5.2.2.1 presents an excerpt from the Fact Sheet. The NO_X and VOC offset analysis for the operation phase is detailed in Section 6.

- Obtaining offsets in the ratio of total actual emission reductions to the increase in actual emissions of 1.2:1 of VOC or NO_X and obtaining an additional 5% offsets as part of a set aside mandated by the Massachusetts Public Benefit Set Aside (PBSA) program, amounting to a total offset purchase of 1.26:1 of NO_X offsets. The NO_X and VOC offset analysis for the operational phase is detailed in Section 6.

- A Source Impact Analysis to demonstrate that the proposed offsets required when considered in conjunction with the proposed emission increase will have a net air quality benefit in the affected area, will not contribute to non-attainment or maintenance in another state of any primary or secondary NAAQS, and will not interfere with another state's SIP for PSD or visibility. The source impact analysis is discussed in Section 6 and will be further supported with the modeling analysis.

- Demonstration to MassDEP that the benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification. The benefits analysis is discussed below and is supported by the information in the COP.

- Public comment, including an opportunity for a public hearing.

5.2.2.1. Construction Offsets

EPA and state/local permitting authorities implementing the NNSR program have interpreted the NNSR CAA requirements as only requiring offsets for operating emissions, not construction emissions. This is supported by text in the Clean Air Act and is reflected in EPA regulations.

The federal regulations at 40 CFR § 51.165 that set forth the requirements for approving state and local NNSR programs are silent on the offset requirements for construction emissions. However, EPA has expressly excluded construction emissions from another NNSR regulation, which began as the Emissions Offset Interpretative Ruling, and was later codified at 40 C.F.R. Part 51, Appendix S.

Part 51, Appendix S applies when an area that is transitioning from attainment to nonattainment for one or more NAAQS does not yet have EPA-approved regulations in place for implementing NNSR and for major sources locating in nonattainment areas in Indian country. In section IV.B., Appendix S states the following:

"Temporary emission sources, such as pilot plants, portable facilities which will be relocated outside of the nonattainment area after a short period of time, and emissions resulting from the construction phase of a new source, are exempt from Conditions 3 and 4 of this section," in which Conditions 3 and 4 specify the requirements to obtain emission offsets (emphasis added).

Thus, under this provision, in areas subject to Appendix S, construction emissions need not be offset. Furthermore, EPA has previously clarified that it was not the intent of the Emissions Offsets Interpretive Ruling at Part 51, Appendix S to cover emissions from projects "that occur for only a relatively short period of time and are associated with the construction of a new project."

The Massachusetts NNSR regulations at 310 C.M.R. 7.00, Appendix A, which apply in this case since Massachusetts is the COA for this action, do not address the application of offset requirements to construction emissions. Nevertheless, in practice, Massachusetts has not required offsets for construction emissions in permits issued under its approved NNSR program, consistent with EPA's regulation in 40 C.F.R. Part 51, Appendix S, and the language in section 173 of the CAA described above. This Massachusetts practice is also consistent with the practice in other states, one of which has a regulation that expressly excludes construction emissions from the offset requirement in its NNSR permitting program.

Per this discussion within the SFW Supplemental Fact Sheet, Revolution Wind will not be required to purchase offsets for construction emissions, though determining applicability to the NNSR program will continue to include construction emissions per Section 328 of the Clean Air Act. Per Table 5-3, RWF will be subject to NNSR for NO_X and VOCs. The offset analysis for O&M emissions is presented in Section 6.

5.2.3. Benefits Analysis

In addition, as a part of the NNSR process required under 310 CMR 7.00 Appendix A(8)(b), Revolution Wind is required to demonstrate that the benefits of the proposed source significantly outweigh the environmental and social costs imposed, as a result of its location, construction, or modification. This demonstration is required to include a discussion/analysis of alternative sites, sizes, production processes, and environmental control techniques for the proposed modified test cells. A similar type of analysis was included in the Revolution Wind COP submittal. Portions of that analysis as well as additional information to address the Appendix A(8)(b) requirement are discussed as follows.

5.2.3.1. Analysis of Alternative Sites, Sizes, Production, and Processes

In 2013, BOEM divided and auctioned the Rhode Island/Massachusetts Wind Energy Area (RI-MA WEA) as two lease areas (North Lease OCS-A 0486 and South Lease OCS-A 0487). The Project is located within the Lease Area OCS-A 0486. The location of the RI-MA WEA was the result of a multi-year effort by state and federal regulatory agencies to identify OCS areas suitable for offshore renewable energy development. An extensive review of site characterization data and the assessment of potential impacts was conducted, including environmental, economic, cultural, and visual resources, and use conflicts. More details on the history of siting are included in the COP.

5.2.3.2. Environmental Control Techniques

A LAER and state BACT analysis was conducted to evaluate environmental controls for the engines. According to the LAER analysis, add-on air pollution control is not feasible for the engines. However, the engines will be designed to meet the NSPS and reciprocating internal combustion engines (RICE) Maximum Achievable Control Technology (MACT) standards depending on their model year and size. In addition, work practices such as preventive maintenance and use of low-sulfur fuel will be implemented to minimize air emissions.

5.2.3.3. Minimizing Environmental Costs

As a part of this permitting effort, air dispersion modeling is being conducted for NO_X emissions to show compliance with the NO_X NAAQS. Impacts to the ambient air are well within the standards and guidelines designed to protect public health. In addition, Revolution Wind will purchase the required NO_X offsets to offset NO_X emission resulting from the Project. The purchase of these offsets included additional 5% “set aside” offsets required as per MassDEP PBSA program.

The use of wind to generate electricity reduces the need for electricity generation from new traditional fossil fuel powered plants in New England that produce greenhouse gas emissions. Table 5-5 presents the estimated annual and lifetime avoided emissions from the operation of the RWF. Avoided emissions were based on New England’s annual non-baseload emission rates (Abt Associates, 2020). The estimated annual emissions were calculated based on a maximum 2,991,014 MW-hours generated per year, and a minimum 2,392,812 MW-hours generated per year. The estimated lifetime emissions were calculated by applying the maximum and minimum generated MW-hours per year to the maximum and minimum project life of 20 and 35 years, respectively. The Project is expected to annually displace CO_2, CH_4, N_2O, NO_X, and SO_2 produced by the New England electric grid and decrease the creation of GHG in the atmosphere from these sources.

Table 5-5 Annual and Lifetime Avoided Emissions for the Operation of the RWF (tons)

Term	Power Generated (MW-hr)	CO_2	CH_4	N_2O	CO_2e	NO_X	SO_2
Maximum Annual Avoided Emissions	2,991,014	1,392,275	129	16.5	1,400,236	749	398
Minimum Annual Avoided Emissions	2,392,812	1,113,820	103	13.2	1,120,189	599	318
Maximum Lifetime (35-year) Avoided Emissions	104,685,504	48,729,637	4,106	576	49,008,257	26,224	13,923
Minimum Lifetime (20-year) Avoided Emissions	47,856,230	22,276,405	2,076	263	22,403,775	11,988	6,365

5.2.3.4. Minimizing Social Costs

There are minimal social costs and multiple social benefits associated with the Project. The Project will provide clean reliable offshore wind energy that will increase the amount and availability of renewable energy to New England consumers while creating the opportunity to displace electricity generated by fossil fuel-powered plants and offering substantial economic and environmental benefits to the New England Region. The COP evaluated the socioeconomic impacts from the offshore and onshore facilities of the Project. The socioeconomic impacts that were evaluated included population, economy, employment resources, housing and property values, public services, recreation and tourism, commercial and recreational fishing, commercial shipping, coastal land use and infrastructure, other marine uses, and environmental justice.

6. AIR POLLUTION CONTROL

6.1. Best Available Control Technology/Lowest Achievable Emission Reduction Process

As a part of the pre-construction review, the PSD program requires that a BACT analysis must be completed for pollutants triggering PSD. This consists of a case-by-case BACT demonstration, taking into account energy, environmental, and economic impacts, as well as technical feasibility.

EPA's process for conducting BACT analyses is referred to as a "top down" BACT analysis. This entails using a five-step process as follows:

- Step 1 – Identify All Control Technologies
- Step 2 – Eliminate Technically Infeasible Options
- Step 3 – Rank Remaining Control Technologies by Control Effectiveness
- Step 4 – Evaluate Most Effective Controls and Document Results
- Step 5 – Select BACT (LAER)

The NNSR program requires that as a part of a NNSR permit application, the implementation of LAER must be evaluated. As per the federal regulations for a State Implementation Plan (SIP) contained in 40 CFR 51.165(a)(1)(xiii), LAER means, for any source, the more stringent rate of emissions based on the following:

- The most stringent emissions limitation which is contained in the implementation plan of any state for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable, or

- The most stringent emissions limitation which is achieved in practice by such class or category of stationary sources. This limitation, when applied to a modification, means the lowest achievable emissions rate for the new or modified emissions units within a stationary source. In no event shall the application of the term permit a proposed new or modified stationary source to emit any pollutant in excess of the amount allowable under an applicable new source standard of performance.

In this permit application, a BACT analysis is required for pollutants triggering PSD permitting: NO_2, CO, PM_{10}, $PM_{2.5,}$ VOC, and GHG as CO_{2e}, and a LAER analysis is required for pollutants triggering NNSR permitting: NOx and VOC.

LAER is determined by reviewing the most stringent emissions limitations contained in any state or federal regulation, and, in this section, both LAER and BACT are determined by evaluating the RACT/BACT/LAER Clearinghouse (RBLC), the California Air Resources Board (CARB) database and the South Coast Air Quality Management District's (SCAQMD's) database for potential controls in a manner similar to a top-down BACT analysis. However, in the case of LAER evaluations, the most effective feasible control technology is selected regardless of cost, whereas cost is a consideration in Step 4 of the BACT analysis.

For NOx and VOC, both a BACT and a LAER analysis are required. However, since LAER is more stringent than BACT, only a LAER analysis is presented here for NOx and VOC.

In addition, Massachusetts rules under 310 CMR 7.02(8)(a) stipulates that a state BACT analysis is required for all Limited Plan Approvals (LPAs) and Comprehensive Plan Approvals (CPAs). A LAER analysis is more stringent and satisfies the BACT requirement of 310 CMR 7.02(8)(a) for all Massachusetts plan approvals. However, the LAER analysis is required by NNSR only for NOx and VOC and the BACT analysis is required by PSD only for NO_2, CO, PM_{10}, $PM_{2.5}$, VOC and GHG as CO_{2e}, as such, a state BACT analysis will be included only for other criteria pollutants, namely SO2$_2$ and lead as listed in MassDEP's BACT guidance document.

Pursuant to 310 CMR 7.00, both the BACT and LAER analyses undertaken here, include a review of emission limitations for diesel fired engines and gasoline fired engines contained in any state SIP and a review of emission limitations achieved in practice for engines, through an RBLC, CARB, and SCAQMD databases search. Under NNSR, a proposed new or modified source may not be permitted to emit any pollutant in excess of the amount allowable pursuant to the applicable new source standards of performance (i.e., NSPS and NESHAP).

The first part of the BACT and LAER analyses will consider the regulations contained in any state SIP.

Most states have adopted the federal NSPS and NESHAPs standards. As such, they will be discussed first. Then other states with more stringent regulations will be discussed. The second part of BACT and LAER analyses will discuss control technology implemented in practice. Data will be obtained from the RBLC, CARB, and SCAQMD databases and control technologies will be evaluated for technical feasibility. Using the results of the state regulation and RBLC review, a top-down BACT/LAER analysis will be conducted for NOx/NO2, CO, PM_{10}, $PM_{2.5}$, VOC and GHG as CO_{2e}. A State BACT analysis follows for SO_2 and lead. This section will conclude with the discussion of offsets required for NOx and VOC as a part of the NNSR program. These sections combine the NOx/NO_2, CO, PM_{10}, $PM_{2.5}$, VOC and GHG as CO_{2e} BACT and LAER discussions to streamline the analyses. An outline of these sections follows.

- Federal regulation review with respect to regulations affecting engines
- State regulation review with respect to regulations affecting engines
- Emissions achieved in practice through RBLC, CARB and SCAQMD searches
- Top-down BACT/LAER analyses
- Offset requirements

6.2. Federal Regulations

6.2.1. New Source Performance Standards

There is one NSPS applicable to diesel fired engines: 40 CFR 60 Subpart IIII entitled "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines." There is one NSPS applicable to gasoline engines: 40 CFR 60 Subpart JJJJ entitled "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines."

The NSPS standards for compression ignition (CI) engines entitled "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines," contained in 40 CFR 60 Subpart IIII will apply to the engines used in the project. These standards are applicable for the following types of stationary engines:

- Stationary CI ICEs with a displacement of less than 30 liters per cylinder where the model year is 2007 or later, for engines that are not fire pump engines
- Stationary CI ICE that commences construction (date the engine is ordered) after July 11, 2005, where the stationary CI ICE is manufactured after April 1, 2006, and are not fire pump engines.
- Stationary CI ICE that are modified or reconstructed after July 11, 2005.

These regulations set air emission standards for both emergency and non-emergency engines. The engines that will be used in the construction and operation of this project include propulsion engines that will be used to power vessels as well as stationary engines used on equipment on the vessels, which typically will be only non-emergency engines. Because mostly non-emergency engines will be used, the majority of this section details the NSPS requirements for non-emergency engines.

The NSPS requirements and emission limitation are grouped by the following engine characteristics:

- Whether the engine is an emergency or non-emergency engine
- Model year of the engine (date that construction commences is the date the engine is ordered by the owner/operator).
- Maximum power of the engine
- Displacement of the engine

Since the vessels used in this project are likely to have a displacement of equal to or greater than 30 liters per cylinder, the NSPS emission standards contained in 40 CFR 60.4204(c) applying to that class of engines are summarized in Table 6-1.

Table 6-1 NOx Emission Standards for Non-Emergency CI Engines with > 30 Liter/Cylinder Displacement

Installation Date/Maximum Engine Speed (rpm)	Allowable Nitrogen Oxide (NOx) Emissions		
	< 130	130< x < 2000	>2000
Prior to 1/1/2012	17 g/kW-hr (12.7 g/HP-hr)	45 x n-0.2 g/kW-hr (34 x n-0.2 g/HP-hr)	9.8 g/kWhr (7.3 g/HP-hr)
On or after 1/1/2012 and before 1/1/2016	14.4 g/kW-hr (10.7 g/HP-hr)	44 x n-0.23 g/kW-hr (33 x n-0.23 g/HP-hr)	7.7 g/kW-hr (5.7 g/HP-hr)
On or after 1/1/2016	3.4 g/kW-hr (2.5 g/HP-hr)	9.0 x n-0.2 g/kW-hr (6.7 x n-0.2 g/HP-hr)	2.0 g/kW-hr (1.5 g/HP-hr)

Source: 40 CFR 60.4204(c)
n = maximum engine speed,
g/HP-hr = grams per horsepower-hour
g/kW-hr = grams per kilowatt hour
rpm = revolutions per minute

In addition, the NSPS requirements in 40 CFR 60.4204(c)(4), require that PM emissions be either reduced by 60% or more, or limited to 0.15 g/kW-hr (0.11 g/HP-hr).

Instead, if the engines used onsite are pre-2007 model year non-emergency CI engines with < 10 liter/cylinder displacement, or 2007-2010 model years with 2237 kilowatts (kW; 3,000 horsepower [HP]) with < 10 liter/cylinder displacement, then the following standards will apply.

Table 6-2 NOx Emission Standards for Pre-2007 and 2007-2010 Model Year Engines

Maximum Engine Power	Emission Standards[a] g/kW-hr (g/HP-hr)				
	NMHC+NOx	HC	NOx	CO	PM
kW<8 (HP<11)	10.5 (7.8)			8.0 (6.0)	1.0 (0.75)
8≤kW<19 (11≤HP<25)	9.5 (7.1)			6.6 (4.9)	0.80 (0.60)
19≤kW<37 (25≤HP<50)	9.5 (7.1)			5.5 (4.1)	0.80 (0.60)

37≤kW<56 (50≤HP<75)			9.2 (6.9)		
56≤kW<75 (75≤HP<100)			9.2 (6.9)		
75≤kW<130 (100≤HP<175)			9.2 (6.9)		
130≤kW<225 (175≤HP<300)		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
225≤kW<450 (300≤HP<600)		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
450≤kW<560 (600≤HP<750)		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)
kW>560 (HP>750)		1.3 (1.0)	9.2 (6.9)	11.4 (8.5)	0.54 (0.40)

[a] NOx emission standards for stationary pre-2007 model year non-emergency CI engines with <10 liter/cylinder displacement and 2007-2010 model year non-emergency engines > 2237 kW (3,000 HP) and with < 10 liter/cylinder displacement.
HC = hydrocarbon
NMHC = non-methane hydrocarbon

Sometimes, the NSPS references other standards for emission certifications. The following nonemergency CI engines have to be certified according to the standards listed in Table 6-3.

Table 6-3 Non-emergency CI Engines Certification Standards

Regulatory Citation	Model Year	Maximum Engine Power	Displacement (liter/cylinder)	Certification Standards
40 CFR 60.4201(a)	2007 and later	≤2,237 kW (3,000 HP)	<10	Certification emission standards for new nonroad CI engines in 40 CFR 89.112, 40 CFR 89.113, 40 CFR 1039.101, 40 CFR 1039.102, 40 CFR 1039.104, 40 CFR 1039.105, 40 CFR 1039.107 & 40 CFR 1039.115, as applicable for all pollutants for same model year and maximum engine power or 40 CFR 94 if used in marine offshore installations
40 CFR 60.4201(c)	2011 and later	>2,237 kW (3,000 HP)	<10	Certification emission standards for new nonroad CI engines in 40 CFR 1039.101, 40 CFR 1039.102, 40 CFR 1039.104, 40 CFR 1039.105, 40 CFR 1039.107 & 40 CFR 1039.115, as applicable for all pollutants for same model year and maximum engine power or 40 CFR 94 if used in marine offshore installations.
40 CFR 60.4201(d)(1)	2007-2012	Any	10≤x<30	Certification standards for new marine engines in 40 CFR 94.8, as applicable for same displacement and maximum engine power
40 CFR 60.4201(d)(2)	2013	≥3,700 kW (4,958 HP)	10≤x<15	
40 CFR 60.4201(d)(3)	2013	Any	15≤x<30	
40 CFR 60.4201(e)(1)	2013	<3,700 kW (4,958 HP)	10≤x<15	Certification emission standards for new marine CI engines in 40 CFR 1042.101, 40

40 CFR 60.4201(e)(2)	2014 and later	Any	10≤x<30	CFR 1042.107, 40 CFR 1042.110, 40 CFR 1042.115, 40 CFR 1042.120 & 40 CFR 1042.145, as applicable for all pollutants for same model year and maximum engine power.
40 CFR 60.4204(a)	Pre-2007	Any	10≤x<30	40 CFR 94.8(a)(1)

It is possible that some gasoline engines may be used on vessels and equipment in this Project. As such the 40 CFR 60 Subpart JJJJ for spark ignition (SI) engines would apply to gasoline engines. In accordance with 40 CFR 60.4231(b), non-emergency gasoline engines manufactured after July 1, 2007 with a maximum engine power >500 HP or manufactured after July 1, 2008 with a maximum engine power <500 HP, will have to be certified to the emission standards for new non-road SI engines in 40 CFR 1048.

6.2.2. National Emission Standards for Hazardous Air Pollutants

There is one NESHAP (RICE MACT) for engines contained in 40 CFR 63 Subpart ZZZZ entitled "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines."

The engines used in this Project will be subject to the emission limitations and work practice standards of the NESHAP regulation contained in 40 CFR 63 Subpart ZZZZ entitled "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines." (RICE MACT). These standards are applicable to any existing, new, or reconstructed stationary RICE located at a major or area source of HAPs. The Project will be considered an area source of HAPs. For stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006. Otherwise, it is considered a new RICE.

Similar to the NSPS standards, the RICE MACT standards and emission limitation are grouped by the following engine characteristics:

- Whether the engine is an emergency or non-emergency engine
- Model year of the engine
- Maximum power of the engine
- Displacement of the engine

In addition, the RICE MACT standards include standards for OCS sources. This simplifies the emission standards and work practices applicable to the vessels and equipment to be used on the Project. Section 63.6603(c) details the requirements for existing stationary non-emergency CI RICE with a site rating of >300 HP located on an offshore vessel that is an area source of HAP and is a nonroad vehicle that is an OCS source as defined in 40 CFR 55.2. For those types of engines, they do not have to meet the RICE MACT CO emission limitations specified in Table 2d of the regulations. RICE MACT does not require any other emission limitations for any other pollutants for these types of engines. As such, these engines only are required to meet the following work practice standards:

- Change oil every 1,000 hours of operation or annually, whichever comes first. Sources have the option to use an oil analysis program as described in Section 63.6625(i) in order to extend the specified oil change requirement.
- Inspect and clean air filters every 750 hours of operation or annually, whichever comes first, and replace as necessary.
- Inspect fuel filters and belts, if installed, every 750 hours of operation or annually, whichever comes first, and replace as necessary.

- Inspect all flexible hose every 1,000 hours of operation or annually, whichever comes first and replace as necessary.

There are no other RICE MACT standards or emission limitations for OCS air sources. If any gasoline SI RICE are used for the Project, they will have to meet the standards listed in 40 CFR 63 Subpart ZZZZ, Table 2d for existing stationary RICE located at area sources of HAP emissions.

The preamble to the RICE MACT rules gives the reasoning for establishing work practice limits for OCS engines. EPA finalized the OCS engine requirements in the January 30, 2013 amendments to the RICE MACT standards. In the preamble to these regulations, EPA indicated that they received multiple comments regarding the regulation of existing non-emergency engines on OCS sources that become subject to the RICE MACT rules as a result of the OCS regulations. The commenter identified several significant issues related to the application of the NESHAP to the regulation of existing marine vessel engines located on OCS sources, particularly whether the numerical emission standards are technologically feasible for existing marine engines located in the OCS. Commenters noted that emission controls for existing CI RICE to meet the NESHAP standards may be technically infeasible because of weight and space constraints, catalyst fouling from the low-load engine operation required by the U.S. Coast Guard, safety concerns regarding engine back pressure and lack of catalyst vendor experience with retrofitting marine engines. Commenters suggested that marine vessel engines that become subject to the NESHAP as a result of the OCS regulations, should be subject to Generally Available Control Technology (GACT), which is more appropriate for these types of engines. Commenters suggested that management practices similar to those required for existing non-emergency stationary CI RICE smaller than 300 HP are more appropriate GACT for existing non-emergency stationary CI RICE above 300 HP on vessels operating on the OCS. EPA agreed with this interpretation and thus EPA is amending the regulations to reflect management practices compliance for greater than 300 HP engines on the OCS.

6.3. State Regulations

Each Massachusetts regulation that is listed as applicable to OCS sources as per 40 CFR 55.13 that may be applicable to this project is summarized in Section 5.2. Table 5-4 in Section 5.2 includes the regulatory citation, a brief description of the regulation and whether the regulation would be applicable to the Project. This list is current as of the “Outer Continental Shelf Air Regulations: Consistency Update for Massachusetts” published on November 23, 2021, in the Federal Register (86 FR 66509).

In addition to the Massachusetts regulations, regulations for ICEs were reviewed in other states. Most states have adopted the EPA NSPS and RICE MACT regulations for stationary ICE. California SCAQMD regulations were reviewed for engine-related regulations.

There are two California SIP regulations that are stricter than those contained in any other SIP for engines on vessels. Both of these regulations are contained in the California Code of Regulations:

- 17 California Administrative Code (CA ADC) Section 93118.3 entitled “Airborne Toxic Control Measures for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port”, and

- 17 CA ADC Section 93118.5 entitled “Airborne Toxic Control Measure for Commercial Harbor Craft.”

The purpose of the 17 CA ADC Section 93118.3 regulation is to reduce NO_x and PM emissions from auxiliary engines on container vessels, passenger vessels and refrigerated cargo vessels while these vessels are docked at a California port. It applies to any person who owns, operates, charters, rents or leases any U.S.- or foreign-flagged container vessel, passenger vessel or refrigerated cargo vessel. These regulations specify hourly operating restrictions while at berth for auxiliary diesel engines. During other times, the vessels must use shore-based power supplied by the local utility or by equipment that meets the emission standards listed in the rules. However, these rules should not apply to the OCS sources in this permit application as they will not be considered OCS sources while at port.

The purpose of the 17 CA ADC Section 93118.5 regulation is to reduce PM, SO_x, and NO_x emissions from diesel propulsion and auxiliary engines on "harbor craft" (defined in the rules and listed in this section) that operate in "Regulated California Waters" as defined in the rule. The rule only applies to engines on vessels that are permanently affixed to the vessel (i.e., the engine, its fueling system, or exhaust system is welded or otherwise physically connected to the vessel and cannot easily be removed). The rule does not apply to any engine and equipment that falls under the scope of the preemption of Section 209(e)(1)(A) of the CAA (42 USC 7543(e)(1)(A)) and as defined by regulation of EPA.

This regulation requires that all applicable harbor craft used low sulfur fuel that meets CARB diesel fuel requirements, installation and use of non-resettable meters, and requirements for newly acquired harbor craft engines and requirements for in-use engine replacement. The most substantive part of the regulation requires that owners and operators replace or otherwise bring into compliance all pre-Tier 1 or Tier 1 certified engines with either Tier 2 or Tier 3 engines and requires that newly acquired vessel engines meets either the Tier 2, 3, or 4 standards. The compliance dates for each type of engine are listed in the rule. The compliance dates are based on the engine model year, and total annual hours of operation of the engine. However, there are exemptions to the rules, including harbor craft vessels with voyages that are continuous and expeditious navigation through regulated California waters. Other exemptions, which could be applicable to this OCS air permit application include the following exemptions:

Exemptions for:

- Temporary replacement vessels, as approved by the CARB Executive Officer (exempt from engine replacement requirements)
- Temporary emergency rescue/recovery vessels (exempt from the entire rule)
- Ocean going vessels (except tugboats and towboats) (exempt from the entire rule)
- Registered historic vessels (exempt from the engine replacement requirements)
- Engine less than 50 HP (exempt from engine replacement requirements)
- An engine or vessel that is operated less than 300 hours per calendar year (exempt from the engine replacement requirement)
- Near-retirement vessels (exempt from the engine replacement requirements) Definitions as per 17 CA ADC Section 93118.5(d) – "Definitions":

"Harbor Craft" (also called "Commercial Harbor Craft") means any private, commercial, government, or military marine vessel including, but not limited to, passenger ferries, excursion vessels, tugboats, ocean-going tugboats, towboats, push-boats, crew and supply vessels, work boats, pilot vessels, supply boats, fishing vessels, research vessels, U.S. Coast Guard vessels, hovercraft, emergency response harbor craft, and barge vessels that do not otherwise meet the definition of ocean-going vessels or recreational vessels.

"Ocean-going Vessel" means a commercial, government, or military vessel meeting any one of the following criteria:

(A) a vessel greater than or equal to 400 feet in length overall (LOA) as defined in 50 CFR 679.2, as adopted June 19, 1996;

(B) a vessel greater than or equal to 10,000 gross tons (GT ITC) per the convention measurement (international system) as defined in 46 CFR 69.51-.61, as adopted September 12, 1989; or

(C) a vessel propelled by a marine compression-ignition engine with a per cylinder displacement of greater than or equal to 30 liters.

Some of the vessels to be used in the Project will meet the definition of Ocean-going Vessel and thus would be exempt from these requirements which pertain to operation in regulated California waters.

6.4. Emission Standards Achieved in Practice

6.4.1. RACT/BACT/LAER Clearinghouse

A RBLC search was completed for the last 10 years of determinations using the following process types:

17.100 – Large ICEs (> 500 HP)

- 17.110 - Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel)
- 17.120 – Other liquid fuel and liquid fuel mixtures

17.200 – Small ICEs (< 500 HP)

- 17.210 – Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel)
- 17.220 – Other liquid fuel and liquid fuel mixtures

The resulting determinations were divided into three tables: from OCS air permit determinations, large emergency/non-emergency engines (>500 HP), and small emergency/non-emergency engines (<500 HP), which are summarized in Tables 6-4, 6-5, and 6-6, respectively. Each table lists the name, location, and description of the facility; the RBLC and permit numbers; engine description; control technologies; and NOx, CO, PM_{10}, $PM_{2.5}$, VOC and GHG as CO_{2e} emission rates, when provided. For the most part, the RBLC determinations listed control technologies as a whole and did not separate by control methodologies by pollutants.

Table 6-4 lists only OCS determinations that were for the type of equipment (such as propulsion engines and crane engines) to be used in the construction of Revolution Wind. The determinations are listed in each table from the most recent to least recent and only includes Codes 17.110 and 17.210 determinations because no OCS air permit determinations were found for Codes 17.120 and 17.220. All of the facilities with an OCS air permit in the Clearinghouse were oil developers, generally in the Gulf of Mexico off the coast of Florida.

As shown in Table 6-4, the search resulted in the RBLC Control Method Determination of good combustion practices or more specifically "Use of good combustion practices based on the most recent manufacturer's specifications issued for these engines."

Table 6-5 summarizes the results of the RBLC determinations for large engines, for which most of the engines found in the search are emergency-only engines. Of the nearly 150 determinations, the NO_x control method technologies used on the engines, in order of the most common to least common, used are listed as follows.

- Use of certified engine/compliance with NSPS or RICE MACT
- Good combustion practices
- Limited hours of operation
- Engine design, including turbocharging and aftercooling

- Selective catalytic reduction (SCR)

The CO and VOC control technologies, when listed separately, mirror several of the NOx control technologies, with the exception of the addition of an oxidation catalyst, which was listed for only three (3) entries. CO and VOC control strategies are listed in order of the most common to least common, found in the database searches as follows:

- Use of certified engine/compliance with NSPS or RICE MACT
- Good combustion practices
- Limited hours of operation
- Engine design, including turbocharging and aftercooling
- Oxidation catalyst (CatOx)

The PM control technologies, when listed separately, mirror several of the previously stated control technologies, with the exception of the addition of a “diesel PM filter”, which was listed for only three (3) entries. PM control strategies are listed in order of the most common to least common, found in the database searches as follows:

- Use of low sulfur fuel (ultra-low sulfur diesel [ULSD])
- Proper design/good combustion
- Installation of diesel particulate filter (only listed in CARB & SCAQMD database searches)

The GHG as CO_{2e} control technologies, when listed separately, mirror several of the previously stated control technologies. GHG as CO_{2e} control strategies are listed in order of the most common to least common, found in the database searches as follows:

- Good combustion practices
- Limited hours of operation

Most of the entries had a control technology listed as use of an EPA-certified engine/compliance with NSPS or RICE MACT and/or listed good combustion practices as the control technology employed. Some entries also listed limitation on hours of operation or use of low sulfur fuel/ULSD. Only three (3) entries listed the use of SCR for NO_x control and only three (3) entries listed the use of an oxidation catalyst for CO and/or VOC control. Of the two (2) listed SCR for NO_x control and listed oxidation catalyst for CO and VOC control, one (1) was for twelve 17 MW non-emergency generators at a gold mine in Alaska (AK-0084), and one (1) was to control five 2.25 MW non-emergency generators used for peak shaving in Pennsylvania (PA-0292).

The other entry that listed SCR for NOx control was a 2016 determination (revised in 2017) for the control of four 3 MW emergency generators at a combined-cycle gas turbine electric generating facility in New York (NY-0103). However, those units were removed from the facility’s permit in 2018 and replaced with a 1.5 MW emergency diesel generator, without SCR, and subject to emission limits under 40 CFR Part 60, Subpart IIII for the current model years. The facility’s RBLC determination has not been revised since this change.

The other entry that listed an oxidation catalyst for CO and VOC control was a 2022 determination for the control of a 2.1 MW emergency generator at a combined cycle gas turbine electric generating facility in West Virginia (WV-0033). However, the permit determination document shares, *“the application did not completely justify that oxidation catalyst was not technically feasible… the DAQ (Division of Air Quality) should have identified this lack of justification during the application process”*. Furthermore, the permit does not require an oxidation catalyst for the emergency generator and lists an installation date of 2025. Thus, we have determined that this entry that listed an oxidation catalyst for CO and VOC control is not valid for this analysis.

Sixty-five (65) determinations were found for small engines (<500 HP) as shown in Table 6-6. Some of these determinations had no control technologies listed. Although, most had use of an EPA-certified engine/compliance with NSPS or RICE MACT, good combustion practices listed by itself or in concert with the EPA-certified engine/compliance with NSPS/RICE MACT, the use of ULSD or a limit on sulfur content, and/or a listed limitation on hours of operation. Only three (3) of over 200 total database determinations (all 3 were from the CARB & SCAQMD search), listed the use of a PM filter for PM control.

Table 6-4 RACT-BACT-LAER Clearinghouse (OCS Air Permit Determinations)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Proces s Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
12/31/2014	OCS-EPAR4019	7/7/2016	**FL-0350**	Anadarko Petroleum, Inc. Diamond Blackhawk Drilling Project	17.110	Main Propulsion Generator Engines (6035 HP)	Diesel	Use of good combustion practices based on the most recent manufacturer's specifications issued for these engines at the time that the engines are operating under this permit	NOx: DR-ME-01 through DRME-08 Operating at 50% Load and Above: 10.57 g/kWh on a rolling 24-hour average basis. DR-ME-01 through DR-ME-06 Operating Below 50% Load: 57.3 lb/hr on a rolling 24-hour average basis. DR-MR-07 and DR-ME-08 Operating Below 50% Load: 103.5 lb/hr on a rolling 24-hour average basis.	Six 2012 HyundaiHiMsen 9H32/40V 6,035 HP and two 2012 Hyundai-HiMsen 18H32/40V diesel electric engines	The facility consists of the BlackHawk drillship owned by Diamond Offshore Drilling Inc., and associated support vessels. The support vessels may include a combination of supply boats, anchor handling boats, tugboats, barges, stimulation vessels and well evaluation vessels. The proposed project will consist of three phases: the drilling phase, the well completion phase, and the production well maintenance phase. Anadarko will conduct drilling activities at multiple locations in the OCS in the Eastern Gulf of Mexico.
9/16/2014	OCS-EPAR4015	7/6/2016	**FL-0347**	Anadarko Petroleum, Inc. - EGOM	17.110	Main Propulsion Generator Engines (9910 HP)	Diesel	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	NOx: 12.7000 g/kWh Rolling 24-Hour Average PM_{10}: 0.24 g/kWh Rolling 24-Hour Average CO: 0.80 g/kWh Rolling 24-Hour Average PM: 0.43 g/kWh Rolling 24-Hour Average VOC: 0.35 g/kWh Rolling 24-Hour Average PM_{10}/$PM_{2.5}$: 0.24 g/kWh Rolling 24-Hour Average	Four 1998 Wartsila 18V32LNE 9910 HP and Two 1998 Wartsila 12V32LNE 6610 HP	The facility consists of a mobile offshore drilling unit using the Transocean Discoverer Spirit and associated support vessels. The drilling sites are located east of longitude 87.5, west of the Military Mission Line (86°41' west longitude), at least 100 miles from the Louisiana shoreline, and at least 125 miles from the Florida shoreline.

Table 6-4 RACT-BACT-LAER Clearinghouse (OCS Air Permit Determinations)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
5/30/2012	OCS-EPAR4008	5/4/2016	**FL-0338**	Sake Prospect Drilling Project	17.110	Main Propulsion Engines - C.R. Luigs (5875 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high-pressure fuel injection with aftercooler.	NOx: 18.10 g/kWh 24-Hour Rolling CO: 2.42 g/kWh 24-Hour Rolling VOC: 0.39 g/kWh 24-Hour Rolling FPM: 0.43 g/kWh Rolling 24-Hour Average FPM_{10}: 0.24 g/kWh Rolling 24-Hour Average $FPM_{2.5}$: 0.24 g/kWh Rolling 24-Hour Average $CO2_e$: 705 g/kWh Rolling 24-Hour Average	C.R. Luigs has 8 identical MAN B&W 9L32/40-47 5,875 HP diesel electric engines	The facility consists of a mobile offshore drilling unit using either the Transocean ultra-deepwater C.R. Luigs or the Transocean semisubmersible DD1 to conduct exploratory oil and natural gas drilling in lease blocks within the DeSoto Canyon area of the Gulf of Mexico.
					17.110	Main Propulsion Engines - Development Driller 1 (5096 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high-pressure fuel injection with aftercooler.	NOx: 12.10 g/kWh 24-Hour Rolling VOC: 0.62 g/kWh 24-Hour Rolling, 0.50 g/kWh 24-Hour Rolling Loads>55% $FPM/FPM_{2.5}/FPM_{10}$: 0.57 g/kWh 24-Hour Rolling, 0.43 g/kWh Rolling 24-Hour Average Loads>55% $CO2_e$: 829 g/kWh 24-Hour Rolling	Development Driller 1 has eight identical 2002 Caterpillar Model 3612DITA, 5096 HP diesel electric engines.	
					17.210	Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs (305 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	NOx: 82.83 tons per 12-month rolling CO: 17.85 tons per 12-month rolling total VOC: 6.72 tons per 12-month rolling total $PM/PM_{10}/PM_{2.5}$: 5.88 tons per 12-month rolling total $CO2_e$: 3,083 tons per 12-month tolling total		
5/15/2012	OCS-EPAR4009	7/7/2016	**FL-0348**	Murphy Exploration & Production Co.	17.210	Main Propulsion Generators (4425 HP)	Diesel	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturer's specifications for each engine.	NOx: 26.00 g/kWh Rolling 24-Hour Average	Eight 1986 Wärtsilä F316A Diesel Engines	The facility consists of the dynamically positioned Diamond Offshore deepwater drilling vessel Ocean Confidence and an associated support fleet to conduct exploratory drilling and well completion for up to 90 calendar days within a 2-year period at a single well location within its Lloyd Ridge lease block 317. The drill site is located on the OCS in the Gulf of Mexico, approximately 135 miles southeast of the mouth of the Mississippi River and 180 miles from the Florida shoreline.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
1/5/2022	R14-0038	4/1/2022	*WV-0033	Mountain State Clean Energy Maidesville	17.110	Emergency Generator (2100 HP)	ULSD	Combustion Control (retarded timing and/or lean burn), Good Combustion Practices w/ OxCat.	NOx: 24.6 lb/hr CO: 1.94 lb/hr VOC: 0.46 lb/hr PM: 0.15 g/kW-hr	4SLB Diesel-Fired Emergency Engine - Subpart IIII	This project consists of constructing two combined cycle combustion turbines with duct burners, two fuel gas heaters, two emergency engines (emergency generator and fire water pump), and cooling tower. The configuration of these combustion turbines with heat recovery steam generators will be a 2X1. This facility will be co-located next to existing EGU (Longview Power LLC).
11/17/2021	164137 PSDTX1594 GHGPSDTX207	3/8/2022	TX-0933	Nacero Penwell Facility	17.110	Emergency Generators	ULSD	EPA Tier 2 (40 CFR § 1039.101) exhaust emission standards.	Not listed	Emergency Generators - Unknown	Nacero proposes to construct and operate a plant that will convert natural gas to methanol and then convert methanol to a finished gasoline component.
6/7/2021	1010524-003-AC (PSD-FL-444A)	3/4/2022	FL-0371	Shady Hills Combined Cycle Facility	17.110	Emergency Generator (1500 kW)	ULSD	Engine certification.	CO: 3.5 g/kw-hr PM: 0.20 g/kW-hr NOx+NMHC: 6.4 g/kW-hr	1,500 kW Emergency Diesel Generator	The Shady Hills Combined Cycle Facility (SHCCF), a new 573-megawatt (MW) (winter) 1-on-1 combined cycle electrical generating facility to be owned and operated by Shady Hills Energy Center, LLC, which will be located at 14350 Merchant Energy Way, Spring Hill, Florida. The proposed work will be conducted on an approximately 14-acre parcel east of and located adjacent to the existing Shady Hills Generating Station (SHGS) power plant, which is owned and operated by Shady Hills Power Company, L.L.C.
5/4/2021	PSD-LA-709(M-4)	3/4/2022	LA-0379	Shintech Plaquemines Plant 1	17.110	Emergency Generators (1389 HP & 1800 HP)	Gaseous Fuel	Good combustion practices/gaseous fuel burning.	TPM: 0.40 g/hp-hr PM_{10}: 0.40 g/hp-hr NOx: 6.9 g/hp-hr CO: 8.5 g/hp-hr	1389 HP & 1800 HP Emergency Generators	Shintech Plaquemine Plant 1 (SPP-1) is a vertically integrated polyvinyl chloride (PVC) manufacturing facility that also produces intermediate products, including chlorine (and caustic soda (NaOH) as a byproduct), ethylene dichloride (EDC), and vinyl chloride monomer (VCM). Process units include a Chlor-Alkali unit (C/A Unit), a VCM Unit, and a PVC Unit.
4/19/2021	V-20-015	05/26/2021	KY-0115	Nucor Steel Gallatin, LLC	17.110	Emergency Generators (4)	Diesel	The permittee shall prepare a good combustion and operations practices (GCOP) plan that defines, measures, and verifies the use of operational and design practices determined as BACT for minimizing emissions.	PM_{10}: 0.15 g/hp-hr PM2.5: 0.15 g/hp-hr CO: 2.6 g/Bhp-H NOx: 4.8 g/Bhp-H	2922 HP, 700 HP, and 2x 2937 HP Emergency Generators	Nucor Steel Gallatin (NSG) is a steel recycling mini-mill located in Ghent, KY, along the Ohio River, and northeast of Louisville, KY. The NSG mill recycles scrap steel and scrap substitutes using the electric arc furnace (EAF) process. Scrap steel and scrap substitutes are brought to the facility by barge, rail, and truck.
3/17/2021	160538, PSDTX1528, GHGPSDTX204	03/08/2022	TX-0915	NRG Cedar Bayou LLC Unit 5	17.110	Generator	Diesel	Limited hours of operation.	VOC: 0.5 g/hp-hr CO: 2.61 g/hp-hr PM_{10}: 0.022 g/hp-hr $PM_{2.5}$: 60000 PPM TDS	Diesel Generator	
3/17/2021	2305-AOP-R7	5/26/2021	AR-0168	Big River Steel LLC	17.210	Emergency Engines (2700 kW each)	Diesel	Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII	$PM/PM_{10}/PM_{2.5}$: 0.20 g/kw-hr VOC: 1.55 g/kw-hr CO: 3.5 g/kw-hr NOx: 4.86 g/kw-hr CO_2: 163 lb/MMBtu	Emergency Engines SN-110a through SN-110e	The facility will consist of two electric arc furnaces to melt scrap iron and steel, ladle metallurgy furnaces (LMF) to adjust the chemistry, a RH degasser and boiler for further refinement, and casters.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
1/7/2021	74-18A	9/10/2021	MI-0447	LBLW Erickson Station	17.110	Emergency Engine	Diesel	Good combustion practices, burn ultra-low diesel fuel and will be NSPS compliant.	CO: 3.5 g/kW-Hr FPM: 0.2 g/kW-Hr PM_{10}: 1 lb/hr $PM_{2.5}$: 1 lb/hr	4474 kW Emergency Generator	The proposed new plant will be replacing the electrical generating capacity of both BWL's existing coal-fired power plants. BWL intends to retire those coal-fired power plants from service by 2025. However, before they can be retired, the new natural gas power plant must be operational. Emissions in the area will increase for a short period if the new combined-cycle plant is built. However, there will be overall reductions in emissions when the existing coal fired power plants are taken out of service.
2/15/2020	107518 AND PSDTX1383M1	5/10/2021	TX-0911	Formosa Point Comfort Plant	17.110	Emergency Generator	ULSD	Ultra-Low Sulfur Diesel	Unspecified	Emergency Generator	Unspecified
2/9/2020	60326-36	12/9/2020	VA-0333	Norfolk US Naval Shipyard	17.110	Emergency Generator	ULSD	Unspecified	PM_{10}: 1.1 lb/hr $PM_{2.5}$: 1.1 lb/hr	2220 HP Emergency Generator	Norfolk Naval Shipyard (NNSY) specializes in repairing, overhauling and modernizing ships and submarines. Currently, the majority of NNSY's steam is provided by the adjacent Wheelabrator plant (Registration number 61018) and the necessary electricity by the grid. NNSY and Wheelabrator are considered a single stationary source. On May 14, 2019, NNSY submitted an application to construct and operate a combined heat and power plant (CHP) with auxiliary equipment that would provide the facility with its own source of steam and electricity.
11/9/2020	503-1001	11/9/2020	AL-0328	Plant Barry, Alabama Power Company	17.110	Emergency Engines	Diesel	Unspecified	NOx: 3.0 GR/bhp-hr CO: 2.6 g/bhp-hr FPM: 0.15 g/bhp-hr	Diesel Emergency Engine	Unspecified
9/16/2020	160299, PSDTX1576, GHGPSDTX200	09/16/2020	TX-0905	Diamond Green Diesel Port Arthur Facility	17.110	Emergency Generator	ULSD	Limited hours for non-emergency operation	Unspecified	Emergency Generator	A new renewable diesel fuels plant that will produce renewable diesel fuel and other renewable fuels.
9/9/2020	156571, PSDTX1564, GHGPSDTX195	12/01/2021	TX-0904	Motiva Polyethylene Manufacturing Complex	17.110	Emergency Generator	ULSD	Limited hours of operation, Tier 4 exhaust emission standards specified in 40 CFR § 1039.101	Unspecified	Emergency Generator	A new polyethylene plant that will produce both LLDPE and HDPE
8/13/2020	PSD-LA-838	3/4/2022	LA-0383	Lake Charles LNG Export Terminal	17.110	Emergency Engines	Diesel	Comply with 40 CFR 60 Subpart IIII	Unspecified	Emergency Engines	A greenfield facility to liquefy and export natural gas.
8/13/2020	AQ1524CPT01	3/31/2021	*AK-0085	Gas Treatment Plant	17.110	Generator Engine	ULSD	Good combustion practices, ULSD, and limit operation to 500 hours per year.	NOx: 3.3 g/hp-hr CO: 3.3 g/hp-hr TPM: 0.045 g/hp-hr PM_{10}/$PM_{2.5}$: 0.045 g/hp-hr VOC: 0.18 g/hp-hr $CO2_e$: 163.6000 lb/mmbtu	4,060 hp diesel generator	The Gas Treatment Plant (GTP) is part of one integrated liquefied natural gas (LNG) project to bring natural gas from Alaska's North Slope to international markets in the form of LNG, as well as for in-state deliveries in the form of natural gas. The GTP will take gas from the Prudhoe Bay Unit and the Point Thomson Unit and treat/process the gas, before it is sent 807 miles through a 42-inch diameter pipeline to a liquefaction facility in Nikiski on Alaska's Kenai Peninsula for export in foreign commerce.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
7/23/2020	V-20-001	1/25/2021	KY-0110	Nucor Steel Brandenburg	17.110	Emergency Generator (4)	Diesel	The permittee shall prepare a good combustion and operations practices (GCOP) plan that defines, measures, and verifies the use of operational and design practices determined as BACT for minimizing emissions.	FPM: 0.15 g/hp-hr $PM_{10}/PM_{2.5}$: 0.15 g/hp-hr CO: 2.61 g/hp-hr NOx: 4.77 g/hp-hr NMHC+ NOx	3x 2922 HP and one 920 HP diesel generators	Plate steel manufacturing plant. The facility recycles scrap steel and scrap substitutes using the electric arc furnace (EAF) process. Scrap steel and scrap substitutes will be delivered to the facility by barge, rail, and truck. Scrap steel, scrap substitutes, and flux will be charged to the EAF and melted by applying electric current through the feed mixture. Molten metal will be tapped to a ladle and transferred to the ladle metallurgy furnace (LMF), where the chemistry and temperature of the steel will be adjusted to customer specifications. From the LMF, the molten metal may be transferred to a vacuum degasser prior to being cast as slabs. The slabs will be heated to a consistent temperature in a reheat furnace and car bottom furnaces, respectively, prior to being rolled and shaped to its final form as hot rolled plate coils, light plates, or heavy plates.
7/17/2020	P0127678	3/4/2022	OH-0383	Petmin USA Incorporated	17.110	Emergency Generator (2)	Diesel	Tier IV engine and good combustion practices	$PM_{10}/PM_{2.5}$: 0.15 g/bhp-hr NOx: 3.0 g/bhp-hr CO: 2.6 g/bhp-hr $CO2_e$: 521.6 g/bhp-hr	2 Identical 3131 HP Emergency Generators	Merchant Pig Iron Production
4/23/2020	155952 PSDTX1556 GHGPSDTX192	11/12/2020	TX-0888	Orange Polyethylene Plant	17.110	Emergency Generators	ULSD	Well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use.	Unspecified	Emergency Generators	An initial NSR, PSD, and GHG project to construct and operate an Olefins Unit, two Polyethylene (PE) Units, and auxiliary support facilities. This permit will consist of furnaces, boilers, heaters, storage tanks, emergency engines, fugitive piping, thermal oxidizers, flares, cooling towers, wastewater treatment plant, loadout facilities, miscellaneous auxiliary support facilities, and associated MSS.
1/17/2020	PSDTX1546 AND GHGPSDTX186	11/12/2020	TX-0876	Port Arthur Ethane Cracker Unit	17.110	Emergency Engines	ULSD	Tier 4 exhaust emission standards specified in 40 CFR § 1039.101, limited to 100 hours per year of non-emergency operation	Unspecified	Emergency Generator	New steam cracking plant (Ethylene Plant) for production of ethylene using ethane as feedstock in Port Arthur, Jefferson County, Texas. The Ethylene Plant will manufacture ethylene, crude propylene, crude butadiene, pyrolysis gasoline and other by-products using a steam cracking process
1/17/2020	156458, PSDTX1562, AND GHGPSDT	11/12/2020	TX-882	SDSW Steel Mill	17.120	Emergency Engines	Diesel	Good combustion practices, clean/ ULS fuel, 100 hour per year limit	NOx: 0.0092 lb/MMBtu VOC: 0.0010 lb/MMBtu CO: 0.0057 lb/MMBtu $CO2_e$: 114.53 lb/MMBtu $PM/PM_{10}/PM_{2.5}$: 0.0001 lb/MMBtu	Emergency Engines	Steel Dynamics Southwest LLC submitted an application to authorize a new steel mini-mill to be located in Sinton, San Patricio County.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
1/6/2020	PSD-LA-812	8/9/2021	LA-0364	FG LA Complex	17.110	Emergency Generators	Diesel	Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. Engines are limited to 100 hours of non-emergency use.	Unspecified	550 hp Emergency Diesel Engines	The FG LA complex will produce ethylene, propylene, ethylene glycol, high density polyethylene, low density polyethylene, linear low-density polyethylene and polypropylene. To support the operation of these production plants, the complex will also include electric power and steam generating units (Utility), wastewater treatment (Central Wastewater Treatment Plant), storage and loading operations (Logistics), and associated flare systems.
12/3/2019	CSD00081 V1.0	8/25/2020	KS-0040	John's Manville at McPherson	17.110	Emergency Engines	Diesel	Emergency Diesel Engine and Fire Pump Subject to NSPS Subpart IIII - Combustion Control and Limited Operating Hours.	FPM: 0.2 gr/kw-hr / 0.15 g/bhp-hr $PM_{10}/PM_{2.5}$: 0.2 gr/kw-hr / 0.15 g/bhp-hr	Two engines: 1359.62 HP and 380 HP. Combined capacity 1740 HP.	Fiberglass Mineral Wool Insulation Manufacturing.
11/26/2019	75-16B	12/23/2020	*MI-0445	Indeck Niles LLC	17.110	Emergency Engine	Diesel	Good Combustion Practices and meeting NSPS Subpart IIII requirements	VOC: 3.5 g/kw-hr NOx: 6.4 g/kw-hr NMHC+ NOx FPM: 0.2 g/kw-hr $PM_{10}/PM_{2.5}$: 1.58 lb/hr	2922 hp Emergency Generator Manufactured in 2011 or Later	Natural gas combined cycle power plant
10/31/2019	118270 PSDTX1398M1 GHGPSDTX62	11/12/2020	TX-0872	Condensate Splitter Facility	17.110	Emergency Generators	ULSD	Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio.	VOC: 0.12 g/kw-hr CO: 0.6 g/kw-hr	Emergency Generators	The site can process upwards of 100,000 bbls of condensate daily via two trains. The site uses a series of separation towers, collectively known as a condensate splitter. Condensate is received and refined into light and heavy naphtha, kerosene/distillate, residuum and liquified petroleum gas. The refined materials are either stored into storage tanks or loaded into either a truck or marine vessel. The condensate splitter's heat is provided by four heaters wherein each heater may combust (control) fuel gas. The combustion of fuel gas is authorized to be routed to the site's flare whereupon heaters are out of service.
9/23/2019	2384-AOP-R0	5/5/2021	AR-0161	Sun Bio Material Company	17.110	Emergency Engines	Diesel	Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII	$FPM/PM_{10}/PM_{2.5}$: 0.02g/kw-hr VOC: 1.6 g/kw-hr CO: 3.5 g/kw-hr NOx: 0.4 g/kw-hr $CO2_e$: 164 lb/mmbtu	Emergency Engines	A kraft paper mill designed with one high yield Kraft softwood Fiberline and two linerboard machines. The plant is initially sized to support an approximate, nominal linerboard production capacity of 4,400 machine dry tons per day at varying base weights.
8/21/2019	210-18	8/9/2021	MI-0442	Thomas Township Energy LLC	17.110	Emergency Engines (2)	Diesel	Good combustion practices and ultra-low sulfur diesel. Maximum 500 hours per year of operation.	NOx: 5.3 g/hp-hr NMHC + NOx each CO: 0.15 g/hp-hr each TPM: 0.04 g/hp-hr each $PM_{10}/PM_{2.5}$: 7.55 lb/1000 gal-hr each VOC: 0.86 lb/hr each	Two (2) diesel-fired emergency engines, each 1,474 HP with a model year of 2011 or later.	New power plant. Thomas Township Energy is proposing to install two combustion turbine generators (CTG). Each CTG is connected to a heat recovery steam generator (HRSG), together referred to as a CTGHRSG. To reduce emissions of nitrogen oxides (NOx), the high-efficiency CTGHRSGs will be equipped with dry low-NOx burners and selective catalytic reduction (SCR). To reduce the emissions of carbon monoxide (CO) and volatile organic compounds (VOCs), each CTGHRSG will be equipped with an oxidation catalyst.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
6/24/2019	52610-1	5/19/2021	VA-0332	Chickahominy Power LLC	17.110	Emergency Generator	Diesel	Good combustion practices, high efficiency design, and the use of ultra-low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw.	NOx: 4.8 g/hp-hr	500 hp (300 kW) Emergency Generator	Natural gas-fired combined cycle power plant, three 1 x1 configuration, 310 MW each, no duct firing, air cooled with two 84 MMBtu/H natural gas-fired auxiliary boilers, three fuel gas heaters, an emergency generator, fire water pump, and circuit breakers.
6/11/2019	T147-39554-00065	5/26/2021	IN-0317	Riverview Energy Corporation	17.110	Emergency Generator	Diesel	Unit shall use good combustion practices and energy efficiency as defined in the permit. 40 CFR 60, subpart IIII 40 CFR 63, subpart ZZZZ	TPM: 0.2 g/kw-hr $PM_{10}/PM_{2.5}$: 0.2 g/kw-hr NOx: 6.4 g/kw-hr NMHC + NOx VOC: 6.4 g/kw-hr NMHC + NOx CO: 3.5 g/kw-hr	2800 hp Emergency Generator	Direct coal hydrogenation plant
					17.110	Emergency Generator	Diesel	Unit shall use good combustion practices and energy efficiency as defined in the permit. 40 CFR 60, subpart IIII 40 CFR 63, subpart ZZZZ	$TPM/PM_{10}/PM_{2.5}$: 0.2 g/kw-hr NOx: 4.0 g/kw-hr NMHC + NOx VOC: 4.0 g/kw-hr NMHC + NOx CO: 3.5 g/kw-hr	750 hp Emergency Generator	
6/9/2019	2305-AOP-R6	11/10/2020	AR-0163	Big River Steel LLC	17.110	Emergency Engines	Diesel	Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII	$FPM/PM_{10}/PM_{2.5}$: 0.2 g/kw-hr VOC: 1.55 g/kw-hr CO: 3.5 g/kw-hr NOx: 4.86 g/kw-hr CO_2: 163 lb/mmbtu	Emergency Generators	The facility will consist of two electric arc furnaces to melt scrap iron and steel, ladle metallurgy furnaces (LMF) to adjust the chemistry, a RH degasser and boiler for further refinement, and casters.
4/25/2019	PSD-LA-781(M1)	3/4/2022	LA-0382	Big Lake Fuels Methanol Plant	17.110	Emergency Engines	Diesel	Comply with standards of 40 CFR 60 Subpart IIII	Unspecified	Emergency Engines	Facility to produce methanol from natural gas
2/14/2019	1139-AOP-R24	9/10/2021	AR-0171	Nucor Steel Arkansas	17.210	Emergency Generator (1073 HP)	Diesel	Good operating practices.	PM: 0.25 g/kw-hr $PM_{10}PM_{2.5}$: 0.20 g/kw-hr NOx: 2.0 g/kw-hr CO: 4.0 g/kw-hr VOC: 1.0 g/kw-hr $CO2_e$: 163 lb/MMBtu	Cold Mill 1 Diesel Fired Emergency Generator	Nucor Steel (Nucor), a Division of Nucor Corporation, owns and operates a scrap steel mill in Hickman, Mississippi County, Arkansas (approximately 10 miles east of Blytheville). Nucor produces flat-rolled steel primarily from steel scrap and scrap substitutes using the electric arc furnace (EAF) process.
2/6/2019	P0125024	6/19/2019	OH-0379	Petmin US Incorporated	17.110	Emergency Generators	Diesel	Tier IV engine Good combustion practices	$PM_{10}/PM_{2.5}$: 0.15 lb/hr NOx: 3.45 lb/hr $CO2_e$: 3632 lb/hr and 181.6 T/yr	Two identical 3131 hp Emergency generators	Merchant Pig Iron Production
12/31/2018	17040013	4/16/2020	IL-0130	Jackson Energy Center	17.110	Emergency Engines	ULSD	Fuel must meet the requirements at 40 CFR 80.510(b) pursuant to 40 CFR 60.4207(b)	NOx: 6.4 g/kw-hr CO: 3.5 g/kw-hr TPM: 0.2 g/kw-hr $CO2_e$: 225 T/yr	One large emergency engine-generator at the plant; one small emergency engine-generator at the switchyard (1500 kW combined).	The proposed facility is designed to generate baseload power. It will consist of two combined-cycle generating units, each with a combustion turbine and associated heat recovery steam generator (HRSG). The turbines would only burn natural gas. Other units include an auxiliary boiler, fuel heater, emergency engines, natural gas piping and components, circuit breakers and roadways.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
12/21/2018	74-18	8/9/2021	MI-0441	LBWL Erikson Station	17.110	Emergency Engines (6000 HP)	Diesel	Good combustion practices, burn ultra-low sulfur diesel, and will be NSPS compliant.	NOx: 6.4 g/kw-hr CO: 3.5 g/kw-hr $PM_{10}/PM_{2.5}$: 2.7 lb/hr	A 6000 HP diesel-fueled emergency engine manufactured after 2006 serving a 4000 kW generator	Natural gas combined-cycle power plant.
					17.110	Emergency Engine (1500 HP)	Diesel	Good combustion practices, burn ultra-low sulfur diesel, and will be NSPS compliant.	NOx: 6.4 g/kw-hr CO: 3.5 g/kw-hr $PM_{10}/PM_{2.5}$: 0.69 lb/hr	A 1500 HP diesel-fueled emergency engine manufactured after 2006 serving a 1,000 kW engine generator	
12/21/2018	P0124972	6/19/2019	OH-0378	PTTGCA Petrochemical Complex	17.110	Emergency Generators (3353 HP)	Diesel	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturer's operating manual	NOx: 4.8 g/bhp-hr VOC: 4.8 g/bhp-hr CO: 2.6 g/bhp-hr $TPM/PM_{10}/PM_{2.5}$: 0.015 g/bhp-hr	3353 HP Emergency Generator	A world-scale petrochemical complex composed of ethylene and ethylene-based derivative plants to manufacture high-density polyethylene (HDPE) and linear low-density polyethylene/HDPE (LLDPE/HDPE). The petrochemical complex will also involve onsite railcar and truck loading, supporting utilities, infrastructure, storage tanks, logistics facilities, and facilities to produce and/or provide required natural gas, water, air, nitrogen, steam, and electricity to support the operation of process units.
					17.110	Emergency Generator (1341 HP)	Diesel	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturer's operating manual	NOx: 4.8 g/bhp-hr VOC: 4.8 g/bhp-hr CO: 2.6 g/bhp-hr TPM: 0.15 g/bhp-hr $PM_{10}/PM_{2.5}$: 0.15 g/bhp-hr	1341 HP Emergency Generator	
9/21/2018	PDS-LA-805	6/19/2019	LA-0331	Calcasieu Pass LNG Project	17.110	Emergency Engines (5364 HP)	Diesel	Compliance with NSPS IIII, good combustion, limit normal operation to 100 hr/yr, and operating practices	NOx: 5.60 g/kW-hr CO: 3.50 g/kW-hr VOC: 0.79 g/kW-hr $PM/PM_{2.5}$: 0.20 g/kW-hr $CO2_e$:1481 T/yr	Large Emergency Engines (50 kW)	New LNG production, storage, and export terminal.
7/30/2018	16060032	2/19/2019	IL-0129	CPV Three Rivers Energy Center	17.110	Emergency Engine (1500 kW)	ULSD	Compliance with NSPS IIII	NOx: 6.4 g/kW-hr CO: 3.5 g/kW-hr PM: 0.20 g/kW-hr $CO2_e$: 241 T/yr	Other units include an auxiliary boiler, fuel heater, engines, natural gas piping and components, circuit breakers and roadways.	The proposed facility is designed to generate baseload power. It will consist of two combined-cycle generating units, each with a CT and associated HRSG. The turbines would burn natural gas and ULSD as a backup fuel. Other units include an auxiliary boiler, fuel heater, engines, natural gas piping and components, circuit breakers and roadways.
7/27/2018	1010524-001-AC	3/4/2022	FL-0367	Shady Hills Combined Cycle Facility	17.110	Emergency Engine (1500 kW)	ULSD	Operate and maintain the engine according to the manufacturer's written instructions	NOx: 6.40 g/kW-hr CO: 3.50 g/kW-hr FPM: 0.20 g/kW-hr	1,500 kW Emergency Diesel Generator	A 573 MW (winter) 1-on-1 combined cycle plant which includes a HRSG with duct firing, along with supporting equipment. Natural gas is the only permitted fuel for the combined cycle unit.
7/16/2018	19-18	2/19/2019	MI-0435	Belle River Combined Cycle Power Plant	17.110	Emergency Engine (2682 HP)	Diesel	State of the art combustion design.	NOx: 4.78 g/HP-hr FPM: 0.15 g/HP-hr $PM_{10}/PM_{2.5}$: 1.18 lb/hr VOC: 1.89 lb/hr	EU EMENGINE: Emergency engine	Natural gas combined-cycle power plant
6/29/2018	167-17 and 168-17	2/19/2019	MI-0433	MEC North, LLC And MEC South LLC	17.110	Emergency Engine (1341 HP)	Diesel	Good combustion practices and meeting NSPS Subpart IIII requirements.	NOx: 4.78 g/HP-hr FPM: 0.15 g/HP-hr PM_{10}: 0.54 lb/h $PM_{2.5}$: 0.52 lb/h CO: 3.5 g/kw-hr VOC: 0.86 lb/hr	EU EMENGINE (north plant): emergency engine	Natural gas combined cycle power plant (two plants: north and south)

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
4/26/2018	52588	6/19/2019	VA-0328	C4GT, LLC	17.110	Emergency Engine	ULSD	Use of good combustion practices and the use of ULSD fuel oil with a maximum sulfur content of 15 parts per million by weight.	NOx: 4.8 g/HP-hr FPM/PM_{10}/$PM_{2.5}$: 0.15 g/hp-hr CO: 6.6 g/hp-hr	Emergency diesel gen	Natural gas-fired combined cycle power plant
3/22/2018	122-17	2/19/2019	MI-0434	Flat Rock Assembly Plant	17.110	Emergency Engines (8x 3633 HP)	Diesel	Use of good combustion practices	NOx: 6.4 g/kw-hr	EUENGINE01 through EUENGINE08	The existing FRAP is an automotive manufacturing plant which consists of a stamping operation, a body shop, a paint shop, and a final assembly shop. The permit application is for the proposed installation of an electronic data center with backup emergency generators at FRAP.
12/18/2017	309-0075	1/11/2018	AL-0318	Talladega Sawmill	17.110	Emergency Engine (250 HP)	Diesel	Unspecified	Unspecified	250 HP Emergency CI, Diesel-fired RICE	A sawmill that produces kiln dried dimensional lumber.
12/04/2017	0110037-017-AC	3/4/2022	FL-0636	Dania Beech Energy Center	17.110	Emergency Generators (2)	ULSD	Ultra-low sulfur diesel	CO: 3.5 g/kw-hr FPM: 0.2 g/kw-hr	Two 3300 kW ULSD-fueled emergency engines. BACT = Subpart IIII limits.	1200 megawatt 2-on-1 combined cycle facility, natural gas-fired, with limited ULSD use. GE 7HA turbines
11/07/2017	P0122829	6/19/2019	OH-0375	Long Ridge Energy Generation LLC – Hannibal Power	17.110	Emergency Generator	Diesel	Good combustion design	NOx: 4.8 g/bhp—hr VOC: 4.8 g/bhp-hr CO: 2.6 g/bhp-hr TPM/PM_{10}/$PM_{2.5}$: 0.15 g/bhp-hr	2206 hp Emergency Generator	Combined cycle combustion turbine power generation facility
10/23/2017	P0122594	6/19/2019	OH-0374	Guernsey Power Station LLC	17.110	Emergency Generators (2)	Diesel	Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturer's operating manual.	NOx: 4.77 g/bhp-hr VOC: 4.77 g/bhp-hr CO: 2.6 g/bhp-hr PM_{10}/$PM_{2.5}$/TPM: 0.15 g/bhp-hr	Two identical 1,645 kW (2,206 HP) emergency diesel-fired generators	1,650 MW combined cycle combustion turbine electrical generating facility
9/27/2017	P0121049	6/19/2019	OH-0372	Oregon Energy Center	17.110	Emergency Generator	Diesel	State-of-the-art combustion design, ultra-low sulfur diesel fuel	CO: 2.6 g/bhp-hr NOx: 4.8 g/bhp-hr VOC: 0.59 g/bhp-hr PM_{10}/$PM_{2.5}$: 0.15 g/bhp-hr	1529 hp Emergency Generator	Combined cycle gas turbine (CCGT) facility
9/15/2017	R14-0015M	5/1/2018	WV-0027	Inwood	17.110	Emergency Engine (900 HP)	ULSD	Engine limited to 100 hours non-emergency use per year.	NOx: 4.77 g/HP-hr PM_{10}: 0.2 g/HP-hr	Emergency generator - esdg14	Insulation manufacturing facility
9/27/2017	P0121049	6/19/2019	OH-372	Oregon Energy Center	17.110	Emergency Generator	Diesel	State-of-the-art combustion design, Ultra-low sulfur diesel	CO: 2.6 g/bhp-hr NOx: 4.8 g/bhp-hr VOC: 0.59 g/bhp-hr PM_{10}/$PM_{2.5}$: 0.15 g/bhp-hr	1529.00 HP Emergency Generator (P003)	Combined cycle gas turbine (CCGT) facility

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
07/27/2017	18-00030C	03/26/2019	PA-0313	First Quality Tissue Lock Haven Plt	17.110	Emergency Generator	Diesel	Unspecified	CO: 3.5 g/kw-hr VOC: 3.5 g/kw-hr TPM: 0.2 g/kw-hr NMHC + NOx: 6.4 g/kw-hr	2500 bhp emergency generator	This plan approval is issued for the construction of 376.5 ton per day paper towel and tissue machine comprised of a wet-end section, a wet-end dryer section, a dry-end dryer section and a dry-end section.
07/12/2017	60277	11/02/2017	VA-0327	Perdue Grain and oilseed LLC	17.110	Emergency Generator	Diesel	Unspecified	VOC: 0.49 lb/hr	760 bhp emergency generator	Facility consists of a grain elevator and a soybean oil extraction plant.
6/30/2017	PSD-LA-780(M-1)	5/01/2020	LA-0312	St. James Methanol Plant	17.110	Emergency Engine (1474 HP)	Diesel	Compliance with NSPS IIII, operation limited to 100 hr/yr	NOx: 19.23 lb/hr $PM_{10}/PM_{2.5}$: 0.08 lb/hr CO: 0.51 lb/hr VOC: 0.4 lb/hr	DEG1-13 - diesel fired emergency generator engine (EQT0012)	New Meoh plant designed to produce 5,275 metric tons per day of refined methanol from natural gas and CO_2 feedstock
6/30/2017	AQ0934CPT01	04/16/2020	AK-0084	Donlin Gold Project	17.110	Emergency Engines (2010 HP)	Diesel	Use of good combustion practices and NSPS Subpart IIII engines.	NMHC & NOx: 8 g/kw-hr CO: 4.38 g/kw-hr TPM: 0.25 g/kw-hr $PM_{10}/PM_{2.5}$: 0.25 g/kw-hr	Two (2) 600 kWe black start diesel generators and four (4) 1,500 kWe emergency diesel generators.	The Donlin Gold Project is a gold mine located 12 miles north of Crooked Creek, Alaska on the Kuskokwim River, about 280 miles northwest of Anchorage. The deposit has proven, and probable reserves estimated at 33.9 million ounces of gold at 2.1 grams per ton and could produce up to 1.5 million ounces annually.
					17.110	Dual Fuel Non-Emergency ICEs (22797 HP)	Diesel and Natural Gas	Oxidation Catalyst, SCR and good combustion practices	NOx 0.53 g/HP-hr PM: 0.22 g/HP-hr FPM: 0.15 lb/hr TPM_{10}/ $TPM_{2.5}$: 0.29 lb/hr CO: 0.18 g/kw-hr VOC: 0.21 g/kw-hr	12 - 17 MW ULSD/natural gas-fired ICEs	
6/21/2017	NE-15-018	08/09/2021	MA-0043	MIT Central Utility Plant	17.110	Cold Start Engine	ULSD	Less than 8 hours of operation per day, less than 300 hours per consecutive 12 month period	NOx: 35.09 lb/hr CO: 2.2 lb/hr CO2e: 3115 lb/hr VOC: 0.85 lb/hr $PM_{10}/PM_{2.5}$: 0.4 lb/hr	Cold start engine	MIT proposes to construct and operate two new 22MW combined heat and power CTs/HRSGs and a new cold start engine at its existing central utility plant.
5/9/2017	59-16A	11/15/2017	MI-0425	Grayling Particleboard	17.110	Emergency Engine (2010 HP)	Diesel	Good design and combustion practices and limited operating hours.	NOx: 21.2 lb/hr CO: 3.5 g/kw-hr FPM: 0.66 lb/hr $PM_{10}/PM_{2.5}$: 0.66 lb/hr	EUEMRGRICE1 in FGRICE (Emergency diesel generator engine)	Particleboard manufacturing.
5/9/2017	59-16A	11/15/2017	MI-0425	Grayling Particleboard	17.110	Emergency Engine (2010 HP)	Diesel	Good design and combustion practices and limited operating hours.	NOx: 4.4 lb/hr CO: 3.5 g/kw-hr FPM: 0.18 lb/hr $PM_{10}/PM_{2.5}$: 0.18 lb/hr	EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine)	Particleboard manufacturing.
04/19/2017	P0118959	06/19/2019	OH-0368	Pallas Nitrogen LLC	17.110	Emergency Generator (5000 hp)	Diesel	Good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII	CO: 2.6 g/bhp-hr NOx: 5.5 lb/hr $PM_{10}/PM_{2.5}$: 0.2 lb/hr VOC: 1.6 lb/hr	5000 hp emergency generator (P009)	Natural gas-based facility for the manufacture of nitrogenous products.
3/23/2017	129-36943-00059	8/22/2017	IN-0263	Midwest Fertilizer Company LLC	17.110	Emergency Engines (3600 HP)	Distillate Oil	Use of good combustion practices	NOx: 4.42 g/HP-hr PM: 0.15 g/HP-hr $PM_{10}/PM_{2.5}$: 0.15 g/HP-hr NOx: 4.42 g/hp-hr CO: 2.61 g/hp-hr VOC: 0.35 g/hp-hr	Emergency generators (eu014a and eu-014b)	Stationary nitrogen fertilizer manufacturing facility
2/17/2017	PSD-LA-766(M3)	4/28/2017	LA-0316	Cameron LNG Facility	17.110	Emergency Engines (3353 HP)	Diesel	Compliance with 40 CFR 60 Subpart IIII, good combustion practices	Unspecified	Emergency generator engines (6 units)	Facility to liquefy natural gas for export (5 trains)
1/4/2017	75-16	3/8/2018	MI-0423	Indeck Niles, LLC	17.110	Emergency Engine (2992 HP)	Diesel	Use of certified EPA engine per NSPS IIII and good combustion practices	NOx: 4.78 g/HP-hr PM: 0.2 g/HP-hr $PM_{10}/PM_{2.5}$: 1.58 lb/hr CO: 3.5 g/kw-hr VOC: 1.87 lb/hr	EUEMENGINE (Diesel fuel emergency engine)	Natural gas combined cycle power plant.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
12/22/2016	PSD-LA-761(M4)	4/28/2017	LA-0317	Methanex - Geismar Methanol Plant	17.110	Emergency Engines (2 @ 2346 HP, 1 @ 755 HP, 1 @ 1193 HP)	Diesel	Compliance with NSPS IIII and 40 CFR 63 Subpart ZZZZ	Unspecified	Emergency Generator Engines (4 units)	Methanol plant (Unit I and Unit II) to produce 6,000 metric tons of methanol by steam reforming natural gas
10/24/2016	V-16-022 R1	1/25/2021	KY-0109	Fritz Winter North America LP	17.110	Emergency Generators (EU72, EU73, and EU74)	Diesel	A good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT.	CO: 2.6 g/hp-hr & 3.73 g/hp-hh $PM_{10}/PM_{2.5}$: 0.149 g/hp-hr & 0.298 g/hp-hr VOC: 4.77 g/hp-hr & 3.5 g/hp-hr	Three (3) diesel fired compression ignition emergency generators that generate 750 kW each and have a displacement of less than 30 liters per cylinder.	This facility consists of a gray iron foundry, casting, and machining operation that produces automotive parts in Simpson County, Kentucky. The facility comprises an approximately 95-acre site, consisting of scrap handling and preparation equipment, melt furnaces, sand and mineral storage, mixing and handling equipment, mold and core making facilities, casting equipment, and finishing facilities where castings are machined and coated.
9/23/2016	P0119495	6/19/2019	OH-0367	South Field Energy LLC	17.110	Emergency Generator (2947 hp)	Diesel	State-of-the-art combustion design	CO: 16.96 lb/hr NOx: 27.18 lb/hr $PM_{10}/PM_{2.5}$: 0.97 lb/hr VOC: 3.84 lb/hr	2,000 kW electric, 2,198 kW mechanical (2,947 hp) emergency diesel generator	1150 MW combined-cycle gas turbine (CCGT) facility
9/2/2016	11-00536A	12/21/2018	PA-0310	CPV Fairview Energy Center	17.110	Emergency Engines (2010 HP)	ULSD	Unspecified	NOx: 4.8 g/HP-hr CO: 2.61 g/bhp-hr PM: 0.15 g/HP-hr	Two (2) 1,500-ekW diesel-fired emergency genset engines. One (1) 422 BHP diesel fired fire water pump engine.	This plan approval authorizes CPV Fairview, LLC to construct and temporarily operate the Fairview Energy Center.
8/31/2016	PSD-LA-804	4/28/2017	LA-0313	St. Charles Power Station	17.110	Emergency Engine (2584 HP)	Diesel	Good combustion practices, compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII and use of ULSD	NOx: 27.34 lb/hr $FPM/FPM_{2.5}$: 0.86 lb/hr CO: 14.81 lb/hr VOC: 27.34 lb/hr	St. Charles Power Station emergency diesel generator 1	The St. Charles Power Station is a new electric power generating facility consisting of two natural gas-fired combined cycle gas turbines, each with a HRSG unit equipped with duct burners, and one steam generator turbine. The St. Charles Power Station will have a predicted net nominal output of 980 MW at iso conditions with supplemental duct firing.
8/26/2016	59-16	7/20/2017	MI-0421	Grayling Particleboard	17.110	Emergency Engine (2144 HP)	Diesel	Good design and combustion practices, EPA certified engines and limited operating hours	NOx: 22.6 lb/hr $FPM/PM_{10}/PM_{2.5}$: 1.41 lb/hr CO: 12.35 lb/hr	Emergency diesel generator engine (EUEMRGRICE in FGRICE)	Particleboard manufacturing
6/30/2016	PSD-LA-803(M1)	4/28/2017	LA-0305	Lake Charles Methanol Facility	17.110	Emergency Engines (4023 HP)	Diesel	Compliance with NSPS IIII	Unspecified	Diesel Engines (Emergency)	Proposed facility to produce methanol, hydrogen, sulfuric acid, CO_2, argon, and electricity from pet coke.
6/17/2016	52525	6/19/2019	VA-0325	Greensville Power Station	17.110	Emergency Engine (4020 HP)	Diesel	Use of good combustion and maintenance practices and Ultra-Low Sulfur Diesel/Fuel (15 ppm max)	NOx: 6.4 g/kW-hr VOC: 6.4 g/kw-hr $PM_{10}/PM_{2.5}$: 0.4 g/kW-hr CO: 3.5 g/kw-hr	Diesel-fired emergency generator 3000 kW (1)	The proposed project will be a new, nominal 1,600 MW combined-cycle electrical power generating facility utilizing three CTs each with a duct-fired HRSG with a common reheat condensing STG (3 on 1 configuration). The proposed fuel for the turbines and duct burners is pipeline-quality natural gas.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
4/15/2016	0560-0385-CA	9/10/2021	SC-0193	Mercedes Benz Vans LLC	17.110	Emergency Generators and Fire Pump	No. 2 Fuel Oil	Meet emission standards of 40 CFR 60, Subpart IIII, limited to 100 hours per year	Unspecified	Generators range from 40 hp to 1500 hp	Mercedes-Benz Vans, LLC (Mercedes-Benz Vans) owns and operates a van assembly plant in Ladson, Charleston County, South Carolina (the Charleston plant). Mercedes-Benz Vans submitted a Prevention of Significant Deterioration (PSD) construction and operating permit application in for the expansion of existing assembly processes and addition of new processes, including a body shop, paint shop, and energy center.
3/01/2016	PSD-LA-792	4/8/2017	LA-0307	Magnolia LING Facility	17.110	Diesel Engines	Diesel	Good combustion practices, use of ultra-low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	Unspecified	Water Pumps (2 units) = 355 hp Tank Deluge Pumps (2 units) = 800 hp Generator = 1340 hp	A new facility to liquefy 8.0 million metric tons per year of natural gas
3/10/2016	18068/BOP150001	4/17/2018	NJ-0084	PSEG Fossil LLC Sewaren Generating Station	17.110	Emergency Engine	ULSD	Use of ULSD, limited to 44 hr/yr	NOx: 42.3 lb/hr CO: 3.5 lb/hr VOC: 1.0 lb/hr FPM/PM_{10}/$PM_{2.5}$: 0.26 lb/hr	Diesel-fired emergency generator	PSEG Fossil LLC Sewaren Generating Station is located in Middlesex County, New Jersey. This project to be built at Sewaren would be a 1-on-1 (1 CT and a single steam turbine) combined-cycle electric generating unit including its ancillary equipment. The electric output of the CCCT at ISO conditions will be approximately 345 MW and the approximate output of the steam turbine at these conditions and with 100% supplemental heat input will be 240 MW.
3/09/2016	0930117-001-AC	7/06/2016	FL-0356	Okeechobee Clean Energy Center	17.110	Emergency Generators (3)	Diesel	Use of clean fuel	TPM: 0.2 g/kw-hr CO: 3.5 g/kw-hr	Three 3300-kW ULSD emergency generators	Fossil-fueled power plant, consisting of a 3-on-1 combined cycle unit and auxiliary equipment. The combined cycle unit consists of three GE 7HA.02 turbines, each with nominal generating capacity of 350 MW. The total generating capacity for the combined cycle unit is 1,600 MW.
2/3/2016	3-1326-00275/ 00009	9/28/2017	NY-0103	Cricket Valley Energy Center	17.110	Emergency Engine (4020 HP)	ULSD	SCR and Good Combustion Practices	NOx: 2.11 g/HP-hr VOC: 0.11 g/bhp-hr CO: 2.6 g/bhp-hr FPM: 0.15 g/HP-hr	The facility will include a natural gas-fired auxiliary boiler, four ULSD-fired black-start generator engines and a ULSD-fired emergency fire pump engine.	Cricket Valley Energy Center LLC constructed the Cricket Valley Energy Center (the Facility), a nominal net 1,000 MW combined-cycle gas turbine electric generating facility, on a site located in Dover, Dutchess County, New York. The Facility consists of three GE Model 7FA.05 CTGs operating in combined-cycle mode with supplemental firing of the HRSGs; natural gas will be the sole fuel fired in the CTGs and duct burners.
1/22/2016	PSD-LA-769(M-1)	9/19/2016	LA-0292	Holbrook Compressor Station	17.110	Emergency Engines (1341 HP)	Diesel	Use of certified EPA engine per NSPS IIII, use of ULSD, and good combustion practices	NOx: 14.16 lb/hr $PM_{2.5}$: 0.44 lb/hr VOC: 0.83 lb/hr	Emergency generators no. 1 no. 2	Natural gas compressor station supporting the Cameron LNG Facility in Hackberry, Cameron Parish, Louisiana
1/7/2016	PSD-LA-747(M5)	4/28/2017	LA-0318	Flopam Facility	17.110	Generator Engine	Diesel	Compliance with NSPS IIII	Unspecified	Diesel engines	An existing chemical manufacturing facility

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
12/23/2015	35-00069A	12/21/2018	PA-0309	Lackawanna Energy Ctr./Jessup	17.110	Emergency Engine (2682 HP)	ULSD	Unspecified	NOx: 5.45 g/HP-hr CO: 0.6 g/hp-hr VOC: 0.22 g/hp-hr FPM/PM_{10}/$PM_{2.5}$: 0.025 g/HP-hr	One 2,000 kW diesel-fired emergency generator	This plan approval is for the construction and temporary operation of three identical GE Model 7HA.02 natural gas fired CTs and HRSG with duct burners. Each CT/HRSG combined-cycle process block includes one combustion gas turbine and one HRSG with duct burners with all three CT/HRSG sharing one steam turbine. The entire power block is rated at 1,500 MW.
11/13/2015	PSC CASE NO. 9330	5/13/2016	MD-0045	Mattawoman Energy Center	17.210	Emergency Generator (1490 HP)	ULSD	Good combustion practices and the use of ULSD.	FPM: 0.20 g/hp-hr PM_{10}/$PM_{2.5}$: 0.18 g/hp-hr NOx: 6.4 g/kW-hr CO: 3.5 g/kW-hr	Emergency Generator	990 MW combined-cycle natural gas-fired power plant.
09/11/2015	116055, PSDTX1386, GHGPSDTX100	7/06/2016	TX-0766	Golden Pass LING Export Terminal	17.110	Emergency Engine Generators (6)	Diesel	Equipment specifications & work practices - good combustion practices and limited operational hours	Unspecified	750 hp diesel generators	Liquefied natural gas (LNG) export terminal.
9/1/2015	40-00129A	12/21/2018	PA-0311	Moxie Freedom Generation Plant	17.110	Emergency Engine	Diesel	Sulfur content of the diesel fuel shall not exceed 15 ppm. Shall maintain and operate in accordance with good engineering practice.	NOx: 4.93 g/HP-hr PM/PM_{10}/$PM_{2.5}$: 0.04 g/HP-hr CO: 0.26 g/hp-hr	One diesel engine powered emergency generator	The project is for the construction and operation of two identical 1 x 1 power blocks, each consisting of a CGT or CT and a steam turbine configured in single shaft alignment, where each CT and steam turbine train share one common electric generator.
8/25/2015	P0117655	6/19/2019	OH-0366	Clean Energy Future Lordstown LLC	17.110	Emergency Generator (2346 hp)	Diesel	Low sulfur fuel and State-of-the-art combustion design	CO: 13.5 lb/hr NOx: 21.6 lb/hr PM_{10}/$PM_{2.5}$: 0.77 lb/hr VOC: 3.1 lb/hr	Emergency generator (P003)	962 MW (gross winter output) combined cycle gas turbine (CCGT) facility
7/14/2015	C-12987	6/21/2018	KS-0029	The Empire District Electric Company	17.210	Emergency Engine (1102 HP)	Diesel	Low sulfur fuel oil.	PM/PM_{10}/$PM_{2.5}$: 0.15 g/hp-hr	Emergency Engine	The Empire District Electric Company – Riverton Plant (EDEC) (Source ID: 0210002) is a fossil fuel electricity generation facility located in Cherokee County, Kansas.
6/4/2015	PSD-LA-774(M1)	4/28/2017	LA-0309	Benteler Steel Tube Facility	17.110	Emergency Engines (2922 HP)	Diesel	Compliance with 40 CFR 60 Subpart IIII	NOx: 4.78 g/HP-hr PM_{10}/$PM_{2.5}$: 0.15 g/HP-hr	Emergency generator engines	A facility to produce 600,000 metric tons per year of seamless steel pipe from purchased billets. A steel production facility (including an electric arc furnace) was added.
4/1/2015	118239, N200	1/31/2020	TX-0728	Peony Chemical Manufacturing Facility	17.110	Emergency Engine (1500 HP)	Diesel	Use of certified EPA Tier 2 engine and minimal hours or operation	NOx: 0.0218 g/HP-hr FPM/PM_{10}/$PM_{2.5}$: 0.15 lb/hr CO: 0.0126 g/hp-hr VOC: 0.7 lb/hr	Emergency diesel generator	Ammonia production with hydrogen imported
1/23/2015	AQ1201CPT03	2/19/2016	AK-0082	Point Thomson Production Facility	17.110	Emergency Engines (2695 HP)	ULSD	Unspecified	NOx: 4.8 g/HP-hr CO: 2.6 g/hp-hr FPM_{10}/$FPM_{2.5}$: 0.15 g/HP-hr VOC: 0.0007 lb/hp-hr	Three emergency camp generators	Oil gas exploration and production facility

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
1/14/2015	160-11B	7/6/2016	MI-0418	Warren Technical Center	17.110	Emergency Engines (4676.6 HP)	Diesel	ITR is good design. Engines are tuned for low-NOx operation versus low CO operation.	NOx: 5.97 g/hp-hr	Fg-backup generators (Nine DRUPS emergency engines)	Automotive research
					17.110	Emergency Engines (3631.4 HP)	Diesel	ITR is good design. Engines are tuned for low-NOx operation versus low CO operation.	NOx: 7.13 g/HP-hr	Four emergency engines in FG-BACKUPGENS	
12/31/2014	OCS-EPA-R4019	7/7/2016	FL-0350	Anadarko Petroleum, INC Diamond Blackhawk Drilling Project	17.110	Main Propulsion Generator Engines	Diesel	Use of good combustion practices	Unspecified	Six 2012 Hyundai-HiMsen 9H32/40V 6,035 hp and two 2012 Hyundai-HiMsen 18H32/40V diesel electric engines.	The facility consists of the Blackhawk drillship owned by Diamond Offshore Drilling Inc., and associated support vessels.
12/1/2014	108446/PSDTX1352	3/6/2019	TX-0671	Project Jumbo	17.110	Emergency Engines (5360 HP)	ULSD	Use of certified EPA Tier 2 engine	NOx: 4.05 g/HP-hr	Engines	Plastic Resin Manufacturing Plant
11/21/2014	R14-0030	5/1/2018	WV-0025	Moundsville Combined Cycle Power Plant	17.110	Emergency Engine (2015.7 HP)	Diesel	Unspecified	VOC: 1.24 lb/hr $CO2_e$: 2416 lb/hr	Emergency generator	Nominal 549 MW (output) natural gas-fired combined cycle power plant.
11/5/2014	P0116610	4/1/2019	OH-0363	NTE Ohio, LLC	17.110	Emergency Engine (1474 HP)	Diesel	Compliance with NSPS IIII, emergency operation only, less than 500 hr/yr each for maintenance checks and readiness testing.	NOx: 29.01 lb/hr $PM/PM_{10}/PM_{2.5}$: 0.77 lb/hr	Emergency generator (P002)	Combined-cycle, natural gas-fired power plant
10/31/2014	PSC CASE NO. 9297	5/13/2016	MD-0046	Keys Energy Center	72.210	Emergency Generators (1500 HP each)	ULSD	Use of ultra-low sulfur fuel and good combustion practices.	NOx: 6.4 g/kw-hr CO: 3.5 g/kw-hr PM: 0.20 g/kW-hr PM_{10}: 0.18 g/hp-hr	Diesel-fired auxiliary engines (two).	735 MW combined-cycle natural gas-fired power plant.
9/16/2014	OCS-EPA-R4015	7/6/2016	FL-0347	Anadarko Petroleum Corporation EGOM	17.110	Emergency Diesel Engine	Diesel	Use of good combustion practices with turbocharger, aftercooler, and high injection pressure	Unspecified	3300 hp diesel engine (1998 Wartsila 6R32LNE)	The facility consists of a mobile offshore drilling unit using the Transocean Discoverer Spirit and associated support vessels.
9/5/2014	13060007	5/5/2016	IL-0114	Cronus Chemicals, LLC	17.110	Emergency Engine (3755 HP)	Distillate Fuel Oil	Use of certified EPA Tier IV engines for non-road engines	NOx: 0.5 g/HP-hr CO: 3.5 g/kw-hr $FPM/PM_{10}/PM_{2.5}$: 0.07 g/HP-hr VOC: 0.4 mg/kw-hr	Emergency generator	Plant will produce urea and ammonia, but ammonia production will be limited to a maximum of 3 months of the year (4,880 tpd urea and 2,789 tpd ammonia).
7/22/2014	413-0033-X014 - X020	6/8/2016	AL-0301	Nucor Steel Tuscaloosa, Inc.	17.110	Emergency Engine (800 HP)	Diesel	Unspecified	NOx: 6.8 g/HP-hr FPM: 0.32 g/hp-hr CO: 0.0055 lb/hp-hr	Diesel fired emergency generator	Steel mill adding second baghouse to electric arc furnace, austenitizing furnace, tempering furnace, vacuum degasser, plasma torches, and emergency generators.
7/1/2014	PSC CASE NO. 9136	7/25/2016	MD-0043	Perryman Generating Station	17.110	Emergency Engine (1300 HP)	ULSD	Good combustion practices, limited hours of operation, and exclusive use of ULSD	NOx: 4.8 g/HP-hr PM_{10}: 0.17 g/HP-hr	Emergency generator	120 MW simple cycle natural gas fired power plant Perryman 6 project-wide emission limits: NOx = 58.5 tpy

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
6/9/2014	PSC CASE NO. 9318	5/14/2018	MD-0044	Cove Point LNG Terminal	17.110	Emergency Engine (1550 HP)	ULSD	Good combustion practices, designed to achieve emission limit, and exclusive use of ULSD	NOx: 4.8 g/HP-hr FPM: 0.15 g/HP-hr $PM_{10}/PM_{2.5}$: 0.17 g/HP-hr CO: 2.6 g/hp-hr VOC: 4.8 g/hp-hr NMHC + NOx	Emergency generator	Liquified natural gas processing facility and 130 MW generating station
6/4/2014	129-33576-00059	5/4/2016	IN-0173	Midwest Fertilizer Corporation	17.110	Emergency Engine (3600 HP)	Diesel	Use of good combustion practices, operating hours limited to 500 hours per year.	NOx: 4.46 g/HP-hr $FPM/PM_{10}/PM_{2.5}$: 0.15 g/HP-hr CO: 2.6 g/bhp-hr CO_2: 526.39 g/bhp-hr	Diesel fired emergency generator	A stationary nitrogen fertilizer manufacturing facility
6/4/2014	129-33576-00059	5/5/2016	IN-0180	Midwest Fertilizer Corporation	17.110	Emergency Engine (3600 HP)	No. 2 Diesel	Use of good combustion practices, operating hours limited to 500 hours per year.	NOx: 4.46 g/HP-hr $FPM/PM_{10}/PM_{2.5}$: 0.15 g/HP-hr CO: 2.61 g/bhp-hr VOC: 0.31 g/bhp-hr	Diesel fired emergency generator	A stationary nitrogen fertilizer manufacturing facility
5/23/2014	PSD-LA-778	9/14/2016	LA-0288	Lake Charles Chemical Complex	17.110	Emergency Engines (2682 HP)	Diesel	Use of certified EPA engine per NSPS IIII and good combustion practices	NOx: 27.37 lb/hr $PM_{10}/PM_{2.5}$: 0.88 lb/hr CO: 15.43 lb/hr VOC: 0.85 lb/hr	Emergency diesel generators (EQTs 629, 639, 838, 966, 1264)	Unspecified
5/23/2014	PSD-LA-779	4/28/2017	LA-0296	Lake Charles Chemical Complex LDPE Unit	17.110	Emergency Engines (2682 HP)	Diesel	Use of certified EPA engine per NSPS IIII and good combustion practices	NOx: 27.37 lb/hr $PM_{10}/PM_{2.5}$: 0.88 lb/hr CO: 15.43 lb/hr VOC: 0.85 lb/hr	Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, 1202)	The low-density polyethylene (LDPE) unit will produce LDPE by the high-pressure polymerization of ethylene.
5/23/2014	PSD-LA-781	4/5/2021	LA-0315	G2G Plant	17.110	Emergency Engines (2x 5364 HP)	Diesel	Compliance with NSPS IIII and 40 CFR 63 Subpart ZZZZ, proper design and operation and use of ultra-low sulfur diesel	NOx: 52.58 lb/hr $PM_{10}/PM_{2.5}$: 1.76 lb/hr VOC: 3.86 lb/hr CO: 30.86 lb/hr	Emergency diesel generator 1 and 2	The G2G plant will be a natural gas to gasoline production facility which will use natural gas to produce methanol that will be subsequently converted into gasoline.
4/23/2014	PSC CASE NO. 9280	4/26/2018	MD-0041	CPV St. Charles	72.210	Emergency Generator (1500 kW)	ULSD	Exclusive use of ultra-low sulfur fuel and good combustion practices.	PM/PM_{10}: 0.15 g/hp-hr NOx: 4.8 g/hp-hr CO: 2.6 g/hp-hr VOC: 4.8 lb/MMBtu	Emergency Generator	725 MW combined-cycle natural gas-fired power plant.
4/22/2014	0110037-011-AC	5/5/2016	FL-0346	Lauderdale Plant	17.110	Emergency Generators (4)	ULSD	Good combustion practice	CO: 3.5 g/kw-hr TPM: 0.2 g/kw-hr	Four 3100 kW black start emergency generators	Large natural gas- and oil-fired power facility, consisting of four combined cycle units, and many combustion turbines. Small peaking units being replaced with larger combustion turbines.
4/21/2014	P-2013.0030	9/11/2017	ID-0021	Magnida	72.210	Emergency Generator (2000 kW)	#2 Distillate	Unspecified	$CO2_e$: 22.6 lbs/gal	Emergency Generator Engine	Magnolia Nitrogen Idaho LLC is proposing to construct a new complex for manufacturing nitrogen-based fertilizers from natural gas. The facility will produce ammonia, granulated urea, urea ammonia nitrate (UAN), and diesel exhaust fluid (DEF) for commercial use.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
4/10/2014	R2-PSD 1	5/5/2016	PR-0009	ENERGY ANSWERS ARECIBO PUERTO RICO RENEWABLE ENERGY PROJECT	17.110	Emergency Engine (670 HP)	ULSD	Limited to 500 hours of operation per year	NOx: 2.85 g/HP-hr FPM: 0.15 g/HP-hr CO: 2.6 g/bhp-hr VOC: 0.15 g/bhp-hr	Emergency diesel generator	Energy Answers Arecibo is a new resource recovery facility capable of producing up to 77 megawatts (MW) of electrical power while combusting municipal solid waste, as the primary fuel.
04/08/2014	CPCN CASE NO. 9327	8/12/2020	MD-0042	Wildcat Point Generation Facility	17.110	Emergency Generator (2250 kW)	ULSD	Good combustion practices, low sulfur fuel, limited operation hours	FPM/PM_{10}/$PM_{2.5}$: 0.15 g/hp-hr NOx: 4.8 g/hp-hr CO: 2.6 g/hp-hr	Emergency Generator 1	1000-megawatt combined cycle natural gas-fired power plant
3/31/2014	P0115137	2/19/2019	OH-0359	DTE Marietta	17.110	Emergency Generator (1141 hp)	Diesel	Fuel efficient engine (good combustion practices)	Unspecified	black start generator w/ 1,141 hp diesel engine (P002)	The newly installed DTE facility includes an 8 MW NG fired combustion turbine (83 MMbtu/hr) connected to a 130 MMbtu/hr NG fired HRSG. The cogeneration facility provides electricity and steam to an existing Solvay Specialty Polymers USA, LLC facility.
3/4/2014	54-00082A	2/19/2020	PA-0298	Future Power PA, Good Springs NGCC Facility	17.110	Emergency Generator (670 HP)	Diesel	Unspecified	Unspecified	Emergency Generator	Natural gas-fired combined-cycle electric generation facility that is designed to generate up to 346 MW nominal, using a combustion turbine generator and a heat recovery steam generator that will provide steam to drive a single steam turbine generator.
1/30/2014	NE-12-022	5/5/2016	MA-0039	Salem Harbor Station Redevelopment	17.110	Emergency Generator	ULSD	≤300 hours of operation per 12-month rolling period S in ULSD: ≤0.0015% by weight	PM_{10}/$PM_{2.5}$: 0.15 g/bhp-hr CO_{2e}: 162.85 lb/mmbtu CO:2.6 g/bhp-hr NOx: 4.8 g/bhp-hr	Emergency Engine/Generator	Footprint Power Salem Harbor Development LP (the Permittee) proposes to construct and operate a nominal 630 Megawatt (MW) natural gas fired, quick start (capable of producing 300 MW within 10 minutes of startup) combined cycle electric generating facility (the Facility) at Salem Harbor Station. With duct firing, the proposed Facility will be capable of generating an additional 62 MW, for a total of 692 MW.
11/5/2013	P0113762	4/1/2019	OH-0360	Carroll County Energy	17.110	Emergency Engine (1490.08 HP)	Diesel	Compliance with NSPS IIII	NOx: 13.74 lb/hr PM_{10}/$PM_{2.5}$: 0.49 lb/hr CO: 8.57 lb/hr VOC: 1.93 lb/hr	Emergency generator (P003)	Natural gas fired combined cycle gas turbine electric generating station of nominal capacity of 742 MW
11/1/2013	51-13	7/7/2016	MI-0406	Renaissance Power LLC	17.110	Emergency Engines (1340 HP)	Diesel	Use of good combustion practices	NOx: 4.8 g/HP-hr FPM/PM_{10}/$PM_{2.5}$: 0.15 g/HP-hr CO: 2.6 g/bhp-hr CO2e: 1731.4 T/yr	FG-EMGEN7-8; Two 1,000 kW diesel-fueled emergency reciprocating ICEs	Unspecified
9/26/2013	PSD-LA-767	4/28/2017	LA-0308	Morgan City Power Plant	17.110	Emergency Engine (2680 HP)	Diesel	Use of certified EPA engine per NSPS IIII and good combustion and maintenance practices	NOx: 33.07 lb/hr FPM_{10}/$FPM_{2.5}$: 1.06 lb/hr	2000 kW diesel-fired emergency generator engine	Unspecified
9/25/2013	147-32322-00062	5/4/2016	IN-0179	Ohio Valley Resources, LLC	17.110	Emergency Engine (4690 HP)	Diesel	Use of good combustion practices	NOx: 4.46 g/HP-hr FPM/PM_{10}/$PM_{2.5}$: 0.15 g/HP-hr CO: 2.61 g/bhp-hr VOC: 0.31 g/bhp-hr CO_2: 526.39 g/bhp-hr	Diesel-fired emergency generator	Nitrogenous fertilizer production plant

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
9/18/2013	2305-AOP-R0	12/13/2016	AR-0140	Big River Steel LLC	17.110	Emergency Generators	Diesel	Good combustion practices, limited hours, compliance with NSPS Subpart III	FPM: 0.02 g/kw-hr $PM_{10}/PM_{2.5}$: 0.04 g/kw-hr	Emergency Generators (1500 kw)	The facility will consist of two electric arc furnaces to melt scrap iron and steel, ladle metallurgy furnaces (LMF) to adjust the chemistry, a RH degasser and boiler for further refinement, and casters.
8/1/2013	3-335600136/00001	9/28/2017	NY-0104	CPV Valley Energy Center	17.110	Emergency Generator	ULSD	Good combustion practices, ULSD	VOC: 0.0331 lb/mmbtu FPM: 0.03 g/bhp-hr CO: 0.45 g/bhp-hr	Emergency Generator	CPV Valley Energy Center is a 680 MW combined cycle electric generating facility located in Middletown, NY. The combustion turbines are rated at 2,234 MMBTU/H firing natural gas and 2,145 MMBTU/H firing diesel fuel. The duct burners are rated for 500 MMBTU/H firing natural gas.
7/12/2013	PN 13-037	5/4/2016	IA-0106	CF Industries Nitrogen LLC – Port Neal Nitrogen Complex	17.110	Emergency Generators	Diesel	Good combustion practices	$TPM/PM_{10}/PM_{2.5}$: 0.2 g/kw-hr VOC: 4 g/kw-hr CO: 3.5 g/kw-hr CO_2: 1.55 lb/kw-hr	There are two (2) identically sized generators.	Nitrogenous fertilizer manufacturing including ammonia, urea, and urea-ammonium nitrate (UAN) solutions.
7/2/2013	2008-302-C(M1)PSD	7/29/2016	OK-0154	Mooreland Generating Station	17.110	Emergency Engine (1341 HP)	Diesel	Use of good combustion practices	NOx: 0.011 lb/hp-hr CO: 0.001 lb/hr VOC: 0.0007 lb/hr $PM_{2.5}$: 0.44 lb/hr	Diesel-fired emergency generator engine	WFEC operates the Mooreland Generating Station to generate wholesale electricity which is transmitted over WFEC's system. The Mooreland Generating Station currently consists of three high-pressure boilers that burn locally produced natural gas.
6/18/2013	P0110840	5/4/2016	OH-0352	Oregon Clean Energy Center	17.110	Emergency Engine (3015 HP)	Diesel	Compliance with NSPS IIII, limited to 500 hours of operation	NOx: 27.8 lb/hr PM_{10}: 0.99 lb/hr CO: 27.35 lb/hr VOC: 3.93 lb/hr	Emergency generator	799 Megawatt Combined Cycle Combustion Turbine Power Plant
6/4/2013	12WE1492	5/5/2016	CO-0067	Lancaster Plant	17.110	Emergency Generator	Diesel	NSPS IIII compliant, limited to 500 hours of operation per year	Unspecified	1 839 bhp emergency generator	Natural gas processing facility.
4/23/2013	37-337A	3/2/2020	PA-0291	Hickory Run Energy Station	17.110	Emergency Engine (1135 HP)	ULSD	Unspecified	NOx: 9.89 lb/hr TPM: 0.02 T/yr CO: 5.79 lb/hr VOC: 0.7 lb/hr	A diesel engine-driven emergency generator	Natural gas-fired combined-cycle electric generation facility that is designed to generate up to 900 MW nominal, using 2 CTGs and 2 HRSGs that will provide steam to drive a single STG.
3/27/2013	PSD-LA-768	5/4/2016	LA-0272	Ammonia Production Facility	17.110	Emergency Engines (1200 HP)	Diesel	Use of certified EPA engine per NSPS IIII, limiting operational hours to 500 hr/yr, and good combustion practices	Unspecified	Emergency diesel generator (2205-B)	2780 ton per day ammonia production facility
3/18/2013	C-10656	8/25/2017	KS-0036	Westar Energy – Emporia Energy Center	17.110	Engine associated with fossil fuel power generation facility (900 HP)	Diesel	Use of good combustion practices	NOx: 14 lb/hr TPM/PM_{10}: 0.066 g/hp-hr CO: 1.8 lb/hr VOC: 0.015 g/bhp-hr	Caterpillar C18DITA diesel engine generator	The Westar Energy – Emporia Energy Center (source id: 1110046) is a fossil fuel power generation facility located in Emporia, Kansas.
12/3/2012	141-31003-00579	5/4/2016	IN-0158	St. Joseph Energy Center, LLC	17.110	Emergency Engines (2x 1006 HP and 1 2012 HP)	Diesel	Use of good combustion practices and usage limits (500 hours per year)	NOx: 4.8 g/HP-hr $FPM/FPM_{10}/FPM_{2.5}$: 0.15 g/HP-hr CO: 2.6 g/hp-hr VOC: 1.04 lb/hr	Three emergency diesel generators	Stationary electric utility generating station

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
11/1/2012	08857/BOP110001	4/17/2018	NJ-0080	Hess Newark Energy Center	17.110	Emergency Engine	ULSD	Use of ULSD and 200 hour per year limit	NOx: 18.53 lb/hr FPM: 0.59 lb/hr FPM$_{10}$: 0.66 lb/hr CO: 11.56 lb/hr VOC: 2.62 lb/hr	Emergency diesel generator	Combined Cycle Electric Generating Facility Hess Newark Energy Center, proposed at Newark, New Jersey, would be a new, highly efficient, 655 MW combined-cycle power generating facility.
10/26/2012	12-219	8/13/2013	IA-0105	Iowa Fertilizer Company	17.110	Emergency Generator	Diesel	Good combustion Practices	TPM/PM$_{10}$PM$_{2.5}$: 0.2 g/kw-hr NOx: 6 g/kw-hr VOC: 0.4 g/kw-hr CO: 3.5 g/kw-hr CO_2: 1.55 g/kw-hr	2000 kw Emergency Generator	Nitrogenous fertilizer manufacturing
10/10/2012	08·00045A	4/3/2015	PA-0278	Moxie Liberty LLC/Asylum Power PL T	17.110	Emergency Generator	Diesel	Operating less than 100 hours per year	CO: 0.13 g/bhp-hr VOC: 0.01 g/bhp-hr NOx: 4.93 g/bhp-hr PM$_{10}$/PM$_{2.5}$: 0.02 g/bhp-hr	Emergency Generator	Unspecified
8/28/2012	141-31003-00579 CT-12636	5/11/2018	WY-0070	Cheyenne Prairie Generating Station	17.110	Emergency Generator	ULSD	Tier II controls, ULSD, limited to 500 hours per year	Unspecified	839 hp Diesel Emergency Generator (EP15)	A nominal 220 MW gross electrical facility. The station is to consist of five 40 MW GE LM6000 CTGs with two of the turbines operating in combined cycle mode for an additional 20 MW in generation.
8/20/2012	AQ1201CPT01	5/30/2013	AK-0076	Point Thomson Production Facility	17.110	Diesel Fired Generators	ULSD	Good Combustion Practices and 40 CFR 60 Subpart IIII requirements	NOx: 6.4 g/kw-hr CO: 3.5 g/kw-hr PM$_{2.5}$: 0.2 g/kw-hr	Combustion of Diesel by ICEs	Oil gas exploration and production facility
7/25/2012	18940 – BOP110003	4/17/2018	NJ-0079	Woodbridge Energy Center	17.110	Emergency Engine	ULSD	Use of ULSD and limited operating time	NOx: 21.16 lb/hr CO: 1.99 lb/hr VOC: 0.49 lb/hr PM$_{10}$/PM$_{2.5}$: 0.13 lb/hr	Emergency diesel generator	Woodbridge Energy Center, proposed in Woodbridge Township, New Jersey, would be a new, highly efficient, 700 MW combined-cycle power generating facility.
7/13/2012	160-11A	8/13/2013	MI-0395	Warren Technical Center	17.110	Emergency Engines (9x 4035 HP, 4x 3634 hp)	Diesel	ITR is good design. Engines are tuned for low-NOx operation versus low CO operation.	NOx: 5.98 g/kw-hr & 7.13 g/kw-hr	Nine DRUPS emergency generators, four Emergency Generators	Automotive research
7/9/2012	2012–APP-002009	7/25/2017	CA-1219	City Of San Diego PUD (Pump Station 1)	17.110	Emergency Engine (2722 HP)	Diesel	Use of certified EPA Tier 2 engines operational restriction of 50 hr/yr for maintenance and testing.	NOx: 4 g/HP-hr	IC Engines	Unspecified
7/9/2012	0200-0225-CA	8/27/2014	SC-0159	US10 Facility	17.110	1000 kw Emergency Generators (2)	Diesel	Compliance with NSPS Subpart III, limited to 100 hours per year	VOC: 6.4 g/kw-hr	Emergency Generators GEN1, GEN2	The facility produces components for earthmover tires and then in turn assembles tires from these components.
6/27/2012	T147-30464-00060	5/4/2016	IN-0166	Indiana Gasification, LLC	17.110	Emergency Engines (1341 HP)	Diesel	Use of good combustion practices and limited hours of non-emergency operation to 52 hr/yr, use of low sulfur diesel	NOx: Not Listed PM$_{10}$/PM2.$_{5}$: 15 PPM sulfur	Two emergency generators	The permittee owns and operates a stationary substitute natural gas and liquefied CO_2 production plant.
6/25/2012	2003-099-C(M-3)PSD	5/11/2018	OK-0145	Broken Bow OSB Mill	17.110	Emergency Generators	Diesel	Unspecified	Unspecified	Emerg Diesel Gen	Oriented Strand Board (OSB) Mill includes the OSB pressing operation (press), the wood strand drying operation (drying) and two 150 million BTU per hour (MMBtu/Hr) wood fired furnaces that supply heat for the drying process.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
6/1/2012	15-0027K	2/19/2020	PA-0282	Johnson Matthey Inc./Catalytic Systems Div.	17.110	Emergency Engine (536 HP)	NO. 2 Diesel	Limited hours of operation. No use of fuel which contains sulfur in excess of 0.3% by weight.	NOx: 6.9 g/HP-hr	650 kW diesel emergency generator	This plan approval has been issued to Johnson Matthey, Inc. To establish a plant-wide applicability limit for NOx emissions from the facility.
6/1/2012	09-0142B	2/19/2020	*PA-0292	ML 35 LLC/Phila CyberCenter	17.210	Non-Emergency Engines (3017 HP)	Diesel	SCR & CO Oxidation Catalyst	NOx: 0.67 g/HP-hr TPM: 0.28 lb/hr CO: 3.5 g/kw-hr VOC: 0.08 lb/hr	Diesel generator (2.25 MW each) – 5 units	Installation of five 2 MW electric generators with the associated storage tanks and air pollution control devices including SCR system and oxidation catalysts; conversion of six existing emergency generators to peak shaving generators; and a facility wide NOx emissions cap.
5/30/2012	OCS-EPA-R4008	5/4/2016	FL-0338	Sake Prospect Drilling Project	17.110	Emergency Engine (2064 HP)	Diesel	Use of good combustion practices, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	Unspecified	Emergency Generator Diesel Engine - C.R. Luigs (Caterpillar D3516A 1998)	The facility consists of a mobile offshore drilling unit (MODU) using either the Transocean ultra-deepwater C.R. Luigs or the Transocean semisubmersible DD1 to conduct exploratory oil and natural gas drilling in lease blocks within the DeSoto Canyon area of the Gulf of Mexico.
					17.110	Emergency Engine (2229 HP)	Diesel	Use of good combustion practices, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	Unspecified	Emergency Generator Diesel Engine - Development Driller 1	
5/15/2012	OCS-EPA-R4009	7/7/2016	FL-0348	Murphy Exploration & Production Co.	17.210	Generator Engines (4425 HP)	Diesel	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturer's specifications for each engine	NOx: 26.2 g/kw-hr	Main Propulsion Generators. Eight 1986 Wärtsilä F316A Diesel Engines.	The facility consists of the dynamically positioned Diamond Offshore deepwater drilling vessel Ocean Confidence and an associated support fleet to conduct exploratory drilling and well completion for up to 90 calendar days within a two-year period at a single well location within its Lloyd Ridge lease block 317. The drill site is located on the OCS in the Gulf of Mexico, approximately 135 miles southeast of the mouth of the Mississippi River and 180 miles from the Florida shoreline.

Table 6-5 RACT-BACT-LAER Clearinghouse Determination Summary: Large Diesel Internal Combustion Engines (> 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
5/5/2012	OCS-EPA-R4009	7/7/2016	FL-0348	Murphy Exploration and Production Co	17.110	Emergency Electrical Generator (1100 hp)	Diesel	Use of good combustion and maintenance practices based on the current manufacturer's specifications for this engine.	Unspecified	One 1998 Caterpillar 3508 Diesel Engine	The facility consists of the dynamically positioned Diamond Offshore deepwater drilling vessel Ocean Confidence and an associated support fleet to conduct exploratory drilling and well completion for up to 90 calendar days within a two-year period at a single well location within its Lloyd Ridge lease block 317. The drill site is located on the OCS in the Gulf of Mexico, approximately 135 miles southeast of the mouth of the Mississippi River and 180 miles from the Florida shoreline.
3/15/2012	6372-A1	7/29/2016	DC-0009	Blue Plains Advanced wastewater treatment plant	17.110	Diesel Emergency Generator (2682 hp)	ULSD	Unspecified	NOx: 5.39 g/hp-hr	Diesel Emergency Generator	Wastewater treatment plant using thermal hydrolysis pretreatment process prior to digesting wastewater sludge with anaerobic digesters. Digester gas is used as fuel for combined heat and power (CHP) process.
2/29/2012	160-11	8/13/2013	MI-0394	Warren Technical Center	17.110	Emergency Engines (9x 4035 HP and 4x 3058 HP)	Diesel	ITR is good design. Engines are tuned for low-NOx operation versus low CO operation.	NOx: 4.46 g/HP-hr & NOx: 6.93 g/kw-hr	Nine DRUPS emergency generators, four emergency generators	Automotive research

ACC = acir-cooled condenser
BHP = brake horsepower
CCCT = combined-cycle combustion turbine
CT = combustion turbine
CTG = combustion turbine generator
FRAP = Flat Rock Assembly Plant
GE = General Electric
hr/yr = hour per year
HRSG = heat recovery steam generator
ITR = ignition timing retardation
lb/MMBtu = pounds per million British thermal units
LNG = liquified natural gas
MMBtu/hr = million British thermal units per hour
PVC = polyvinyl chloride
STG = steam turbine generator
tpd = tons per day

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
1/31/2022	2445-AOP-R0	3/4/2022	AR-0173	Big River Steel LLC	17.210	Emergency Engines	Diesel	Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII	NOx: 3.9 g/bhp-hr VOC: 0.13 g/bhp-hr $PM/PM_{10}/PM_{2.5}$: 0.10 g/h CO: 0.90 g/bhp-hr $CO2_e$: 164 lb/MMBtu	Emergency Engines	The steel mill project consists of five key process areas or supporting activities that will have equipment or operations that have the potential to emit emissions of regulated air pollutants. The Facility is capable of producing a variety of rolled steel products and utilizes two EAFs each having a maximum design production output volume of approximately 2,050,000 short tons per year.
8/27/2021	N284, PSDTX1090M1, GHGPSDTX199	3/8/2022	TX-0908	El Paso Electric Company	17.210	Emergency Engine (74 kW)	Natural Gas	Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency operation.	Unspecified	Emergency Engine	A new natural gas simple cycle turbine along with ancillary equipment.
5/5/2021	PSD-LA-773(M2)	3/4/2022	LA-0386	Lasalle Bioenergy LLC	17.210	Generators	Unspecified	Comply with 40 CFR 60 Subpart IIII	Unspecified	Generators	Facility to produce wood pellets from wood logs, chips, dry shaving and clean mill and forest residuals
5/4/2021	PSD-LA-709(M-4)	3/4/2022	LA-0379	Shintech Plaquemines Plant 1	17.210	Emergency Generator (439 HP)	Unspecified	Good combustion practices/gaseous fuel burning.	NOx: 6.9 g/hp-hr CO: 8.5 g/hp-hr $PM/PM_{10}/PM_{2.5}$: 0.40 g/hp-hr	Emergency Generator	Shintech Plaquemine Plant 1 (SPP-1) is a vertically integrated polyvinyl chloride (PVC) manufacturing facility that also produces intermediate products, including chlorine (and caustic soda (NaOH) as a byproduct), ethylene dichloride (EDC), and vinyl chloride monomer (VCM). Process units include a Chlor-Alkali unit (C/A Unit), a VCM Unit, and a PVC Unit.
4/19/2021	V-20-015	5/26/2021	KY-0115	Nucor Steel Gallatin LLC	17.210	Emergency Generator (350 HP)	Diesel	The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan	CO: 2.6 g/hp-hr NOx: 3.0 g/hp-hr $PM/PM_{2.5}$: 0.15 g/hp-hr	Cold Mill Complex Emergency Generator (EP 09-5)	Nucor Steel Gallatin (NSG) is a steel recycling mini-mill located in Ghent, KY, along the Ohio River, and northeast of Louisville, KY. The NSG mill recycles scrap steel and scrap substitutes using the electric arc furnace (EAF) process.
2/18/2021	04-00740C	6/30/20212	*PA-0326	Shell Polymers Monaca Site	17.210	Emergency Generators	Diesel	Use of certified engines, design of engines to include turbocharger and intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards	NOx: 2.37 g/hp-hr & 2.83 g/hp-hr VOC: 2.37 g/hp-hr & 2.83 g/hp-hr PM: 0.06 g/hp-hr & 0.22 g/hp-hr CO: 0.50 g/hp-hr	Emergency Generator Parking Garage & Emergency Generator Telecom Hut & Tower	A petro-chemical facility located in Beaver County and determined to be a Major source of air contaminates and greenhouse gases. Electrical equipment installed under plan approval 04-00740A did not identify that certain components utilized sulfur hexafluoride (SF6) as an insulating medium. The facility submitted a plan approval application for the equipment to evaluate the Prevention of Significate Deterioration (PSD) and Best Available Control Technology (BACT) requirements for the installed equipment.
2/3/2021	PSD-LA-834(M-1)	4/30/2021	LA-0366	Holden Wood Products Mill	17.210	Emergency Engines (2 x 80.5 HP)	Diesel	Good Combustion Practices and Compliance with NSPS 40 CFR 60 Subpart IIII	Unspecified	Sawmill Emergency, and Planer Mill Emergency Generator Engines	The Holden Wood Products Mill produces dimensional lumber. Current operations can be divided into the following areas: log yard operation, rough cutting, lumber drying, lumber finishing, and shipping
1/7/2021	74-18A	9/10/2021	MI-0447	LBWL-Erickson Station	17.210	Emergency Engine (315 HP)	Diesel	Good combustion practices and ULSD	CO: 2.6 g/hp-hr $PM/PM_{2.5}$: 1.2 lb/hr	EUFPRICE	Natural gas combined-cycle power plant

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
8/13/2020	AQ1524CPT01	3/31/2021	*AK-0085	Gas Treatment Plant	17.210	Emergency Generators (335 HP & 200 HP)	Diesel	Good combustion practices, ULSD, and limit operation to 500 hours per year per engine	NOx: 3.6 g/hp-hr CO: 3.3 g/hp-hr $PM/PM_{10}/PM_{2.5}$: 0.19 g/hp-hr VOC: 0.19 g/hp-hr CO2e: 163.6 lb/MMBtu	Dormitory Emergency Generator & Communications Tower Emergency Generator	The Gas Treatment Plant (GTP) is part of one integrated liquefied natural gas (LNG) project to bring natural gas from Alaska's North Slope to international markets in the form of LNG, as well as for in-state deliveries in the form of natural gas.
8/8/2020	N166M2, PSDTX1566, GHGPSDTX196	9/10/2021	TX-0889	Sweeny Old Ocean Facilities	17.210	Emergency Engines	ULSD	Good combustion practices and limited hours of operation	Unspecified	Unspecified	"As-built" amendment for the polyethylene production facility.
7/23/2020	V-20-001	1/25/2021	KY-0110	Nucor Steel Brandenburg	17.210	Emergency Generators (61 HP, 190 HP, 260 HP & 440 HP)	Diesel	A Good Combustion and Operating Practices (GCOP) Plan.	CO: 2.61 g/hp-hr & 3.73 g/hp-hr NOx+NMHC: 2.98 g/hp-hr & NOx: 3.5 g/hp-hr $PM/PM_{10}/PM_{2.5}$: 0.15 g/hp-hr & $PM/PM_{10}/PM_{2.5}$: 0.30 g/hp-hr	Radio Tower, IT, Melt Shop & Rolling Mill Emergency Generators	Plate steel manufacturing plant. The facility recycles scrap steel and scrap substitutes using the electric arc furnace (EAF) process
7/17/2020	P0127678	3/4/2022	OH-0383	Petmin USA Incorporated	17.210	Generator (158 HP)	Diesel	Tier IV engine Good combustion practices	CO: 3.7 g/bhp-hr CO_{2e}: 521.6 g/bhp-hr	Black Start Generator	Merchant pig iron production.
3/31/2020	106921, N270	11/12/2020	TX-0886	Mount Belvieu NGL Fractionation Unit	17.210	Emergency Engine	ULSD	Limited operating hours, good combustion practices meets NSPS IIII Tier 3 engine	Unspecified	Emergency Engine	Oneok proposes to authorize an additional E/P Splitter (EP-2) and two additional fractionation units (Frac-5 and Frac-6) at its site. The E/P Splitter will separate ethane from propane and heavier materials in a mixed ethane-propane feed. Both fractionation units will treat and fractionate a demethanized natural gas liquids mixture (Y-grade) into ethane, propane, isobutane, normal butane, and natural gasoline. Emissions from production operations as well as emissions from planned maintenance, startup, and shutdown activities are included with this project.
12/12/2019	PSD-LA-832	12/16/2021	*LA-0381	EUEG-5 Unit – Geismar Plant	17.210	Emergency Engines (2)	Diesel	Comply with standards of 40 CFR 60 Subpart IIII	Unspecified	Emergency Engines 2-10 and 3-19 (EQT0904 and EQT0905)	Unspecified
9/11/2019	2016-10660C(M-1)PSD	9/10/2021	OK-0181	Wildhorse Terminal	17.210	Emergency Engine (275 HP)	Diesel	Good Combustion Practices. Certified to meet EPA Tier 3 engine standards. Limited operating hours.	VOC: 3.0 g/hp-hr	Emergency engine	The facility receives crude oil via pipeline and tank trucks and stores crude oil in tanks for later transportation via pipeline. No outbound loading stations for tank trucks will be located at the terminal.
9/9/2019	N266, PSDTX1542, GHGPSDTX183	11/12/2020	TX-0864	Equistar Chemicals Channel View Complex	17.210	Emergency Engine	ULSD	Tier 4 exhaust emission standards specified at 40 CFR § 1039.101(b). Limited operating hours.	Unspecified	Emergency engine	New propane dehydrogenation (PDH) unit and a new polypropylene (PP) production unit.
6/16/2019	PSD-LA-751(M3)	8/9/2021	LA-0345	Direct Reduced Iron Facility	17.210	IC Engines (14)	Diesel	Comply with requirements of 40 CFR 60 Subpart IIII	Unspecified	IC Engines	Unspecified
6/13/2019	PSD-LA-751(M3)	3/4/2022	LA-0384	Direct Reduced Iron Facility	17.210	IC Engines	Diesel	Comply with requirements of 40 CFR 60 Subpart IIII	Unspecified	IC Engines	Unspecified

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
2/6/2019	P0125024	6/19/2021	OH-0379	Petmin USA Incorporated	17.210	Generator (158 HP)	Diesel	Tier IV engine and good combustion practices	$PM_{10}/PM_{2.5}$: 0.014 g/hp-hr NOx: 0.30 g/hp-hr $CO2_e$: 522.1 g/hp-hr	Black Start Generator	Merchant pig iron production.
1/28/2019	18-RAB-010	3/8/2022	WI-0291	Graymont Western Lime-Eden	17.210	Emergency Generator (35 kW)	Diesel	Good Combustion Practices	NOx: 4.7 g/kW-hr CO: 5.0 g/kw-hr	Generac Industrial Diesel Generator Set, 3.4 liter, 35 kW	Lime manufacturing.
12/21/2018	74-18	8/9/2021	MI-0441	Lansing Board of Water and Light – Erickson Station	17.210	Emergency Engine (315 HP)	Diesel	Good combustion practices and energy efficiency measures.	CO: 2.6 g/hp-hr $PM/PM10/PM_{2.5}$: 1.2 g/hp-hr	EUFPRICE	Natural gas combined-cycle plant.
7/10/2018	PSD-LA-824	8/6/2021	LA-0349	Driftwood LNG Facility	17.210	IC Engines (200 HP to 1491 HP)	Diesel	Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices	Unspecified	IC Engines (18)	A new facility to liquefy natural gas for export
5/2/2018	PSD-LA-709(M-3)	2/19/2019	LA-0328	Plaquemines Plant 1	17.210	Emergency Engines (375 HP)	Diesel	Good combustion practices and compliance with NSPS IIII	NOx: 4 g/kW-hr CO: 3.5 g/kW-hr VOC: 4 g/kW-hr $PM/PM10/PM2_{.5}$: 0.20 g/kW-hr	Emergency Diesel Engine Pump P-39A	PVC production
					17.210	Emergency Engines (300 HP)	Diesel	Good combustion practices and compliance with NSPS IIII	NOx: 4 g/kW-hr CO: 3.5 g/kW-hr VOC: 4 g/kW-hr $PM/PM10/PM2_{.5}$: 0.20 g/kW-hr	Emergency Diesel Engine Pump P-39B	
2/23/2018	063-3789100037	2/19/2019	IN-0295	Steel Dynamics, Inc. - Engineered Bar Products Division	17.210	Emergency Engine (2 at 75 HP, 1 at 150 HP)	Diesel	Good Combustion Practices	$PM/PM_{10}/PM_{2.5}$: 1.34 g/kW-hr VOC: 1.134 g/hp-hr NOx: 14.06 g/hp-hr CO: 3.08 g/kW-hr	Emergency Diesel Generators 2 units at 75 HP, 1 unit at 150 HP	Steel Mini Mill
					17.210	Emergency Engines (250 HP)	Diesel	None Listed	PM: 0.54 g/kW-hr PM_{10}: 1.34 g/kW-hr VOC: 1.134 g/hp-hr NOx: 9.2 g/kW-hr CO: 3.08 g/hp-hr	Emergency Diesel Generators 2 units	
1/4/2018	2017-0121-C PSD	3/4/2022	OK-0177	Cushing South Tank Farm	17.210	Emergency Engine (450 HP)	Diesel	Good combustion practices, certified to meet EPA Tier III engine standards. Limited operating hours.	VOC: 1.0 g/hp-hr	Emergency Use Engine	The proposed facility will consist of twenty (20) internal (IFR) and external floating roof (EFR) crude oil storage tanks with a total storage capacity of approximately 5.5 million barrels (bbl).
10/2/2017	17-DCF-091	3/8/2022	WI-0279	Enbridge Energy Limited Partnership	17.210	Emergency Generator (125 kW)	Diesel	Complying with NSPS Standards under 40 CFR Part 60 Subpart IIII	Unspecified	Diesel Emergency Generator	Pipeline transportation of crude oil.
7/19/2017	2016-1247-C PSD	5/11/2018	OK-0176	BPV Gathering and Marketing Crushing Station	17.210	Emergency Generator (400 HP)	Diesel	Equipped with non-resettable hour meter. Fired with ultra-low sulfur diesel fuel (0.015 % or less by wt. sulfur.	Unspecified	Emergency Generator	The facility will consist of twenty-four (24) 250,000-bbl external floating roof (EFR) crude oil storage tanks. The new facility will be designed to receive crude oil via pipeline and store crude oil in tanks for later transportation via pipeline.

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
6/30/2017	GHGPSDTX118	11/16/2017	TX-0824	Jackson County Generating Facility	17.210	Emergency Engine (160 HP)	Diesel	Good operating and maintenance practices, efficient design, and low annual capacity	Unspecified	Emergency Diesel-Fired Equipment	Simple cycle electric generation.
6/29/2017	2016-1066-C PSD	5/11/2018	OK-0175	Wildhorse Terminal	17.210	Emergency Engine (275 HP)	Diesel	Good combustion practices, certified to meet EPA Tier 3 engine standards. Limited operating hours,	VOC: 3.0 g/hp-hr	One (1) 275-hp emergency generator	The new facility will be designed to receive crude oil via pipeline and tank trucks and store crude in tanks for later transportation via pipeline. No outbound loading stations for tank trucks will be located at the terminal.
1/9/2017	PSD-LA-890	5/11/2018	LA-0323	Monsanto Luling Plant	17.210	Emergency Engine (400 HP)	Diesel	Proper operation practices, compliance with NSPS 40 CFR 60 Subpart IIII, and limits of hours of operation.	Unspecified	Standby Generator No. 9 Engine Operating hours limited to 100 hr/yr for ready testing.	Chemical Manufacture
12/20/206	PSD-LA-815	12/29/2017	LA-0306	Topchem Pollock, LLC	17.210	Generator Engine (460 HP)	Diesel	Meet NSPS Subpart IIII Limitations and Good Combustion Practices	PM: 0.18 lb/hr CO: 3.18 lb/hr	Generator Engine DEG-16-1 (EQT035)	Ammonia production plant.
8/3/2016	PSD-LA-813	4/28/2017	LA-0314	Indorama Lake Charles Facility	17.210	Emergency Engines (350 HP)	Diesel	Compliance with 40 CFR 63 Subpart ZZZZ	Unspecified	Diesel emergency generator engine - EGEN	Modify and restart-up a mothballed facility to produce 1,009 million lbs/yr of ethylene
7/19/2016	19149/ PCP150001	11/3/2016	NJ-0085	Middlesex Energy Center, LLC	17.210	Emergency Engine	Diesel	Limited hours of operation and exclusive use of ULSD	NOx: 20.6 lb/hr CO: 11.5 lb/hr VOC: 0.557 lb/hr $PM/PM_{10}/PM_{2.5}$: 0.661 lb/hr	Emergency generator diesel	New 633 MW gross facility consisting of one GE 7HA.02 CCCT nominally rated at 380 MW at ISO conditions without duct firing with a maximum heat input rate of: 3,462 MMBtu/hr (HHV) at 0 degrees Fahrenheit, 100% load combusting natural gas -- 3,613 MMBtu/hr (HHV) at 0 degrees Fahrenheit, 100% load combusting ULSD which will be the backup fuel.
6/8/2016	18295, PSDTX1466, GHGPSDTX139	7/7/2016	TX-0799	Beaumont Terminal	17.210	Emergency Engines	Diesel	Equipment specifications and good combustion practices. Operation limited to 100 hours per year.	VOC: 0.0025 lb/hp-hr CO: 0.0068 lb/hp-hr	Emergency Engines	This marine terminal receives, stores, and distributes various volatile organic liquids (VOLs) and refined petroleum products.
5/12/2016	052016-003	5/11/2018	MO-0089	Owens Corning Insulation Systems, LLC	17.210	Emergency Engines	ULSD	Good operating practices.	Unspecified	Emergency Engines	Unspecified
6/5/2017	11-SDD-022	3/8/2022	WI-0271	Kohler Co-Metals Processing Complex	17.210	Emergency Generator (465 HP)	Distillate Fuel	Use of ultra-low sulfur distillate in the generator.	$PM/PM_{10}/PM_{2.5}$: 0.29 lb/hr NOx: 5.9 lb/hr	P10K – Diesel Powered Emergency Generator	Manufacturing of plumbing fixtures, fittings, and contract castings.
1/23/2015	MD-12620	2/19/2016	AK-0082	Point Thomson Production Facility	17.210	Generator Engine (490 HP)	ULSD	Unspecified	VOC: 0.0025 lb/hr NOx: 4.8 g/hp-hr CO: 2.6 g/hp-hr $PM_{10}/PM2_{.5}$: 0.15 g/hp-hr	One 490 HP Airstrip Generator Engine	Oil gas exploration and production facility

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
					17.210	Generator Engine (98 HP)	ULSD	Unspecified	CO: 3.7 g/hp-hr NOx: 5.6 g/hp-hr $PM_{10}/PM_{2.5}$: 0.3 g/HP-hr VOC: 0.0025 lb/hr	Agitator Generator Engine ULSD-fired 98 HP	
					17.210	Generator Engine (102 HP)	ULSD	Unspecified	CO: 3.7 g/hp-hr NOx: 4.9 g/hp-hr $PM_{10}/PM_{2.5}$: 0.22 g/hp-hr VOC: 0.0025 lb/hp-hr	Incinerator Generator Engine ULSD-fired 102 HP	
9/16/2014	OCS-EPA-R4015	7/6/2016	FL-0347	Anadarko Petroleum Corporation – EGOM	72.210	Emergency Generator (427 HP)	Diesel	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure.	Unspecified	Remotely Operated Vehicle Emergency Generator. 2004 Cummins QSM11-G2NR3.	The facility consists of a mobile offshore drilling unit using the Transocean Discoverer Spirit and associated support vessels. The drilling sites are located east of longitude 87.5, west of the Military Mission Line (86°41' west longitude), at least 100 miles from the Louisiana shoreline, and at least 125 miles from the Florida shoreline.
					72.210	Diesel Engine (230 HP)	Diesel		Unspecified	Fast Rescue Craft Diesel Engine	
					72.210	Engines	Diesel		Unspecified	Wireline Diesel Engines	
					72.210	Diesel Engine (208 HP)	Diesel		Unspecified	Water Blasting Diesel Engine	
					72.210	Forklift Engine (30 HP)	Diesel	Use of good combustion practices based on the most recent manufacturer's specifications issued for Engine.	Unspecified	Diesel Powered Forklift Engine	
					72.210	Diesel Engine (39 HP)	Diesel		Unspecified	Escape Capsule Diesel Engine	
					72.210	Diesel Engine (140 HP)	Diesel		Unspecified	Well Evaluation Diesel Engine	
6/12/2014	13-DCF-129	7/7/2017	*WI-0261	Enbridge Energy – Superior Terminal	72.210	Emergency Engine (197 HP)	Diesel	NSPS engine [Tier 3 emergency engine]. Storage tank, conventional fuel oil storage tank, good operating practices; limiting leakage, spills. Engine limited to 200 hours / year (total) and NSPS requirements.	NOx+NMHC: 3.0 g/hp-hr	EG7 - Diesel Emergency Electric Generator w/ tank	Petroleum (Crude Oil) storage facility and pipeline terminal.
1/23/2014	102482, PSDTX1292	5/16/2016	TX-0706	Natural Gas Fractionation	17.210	Emergency engines	ULSD	Unspecified	Unspecified	Emergency Engines	Occidental will build an NGL Fractionation Plant that will receive natural gas liquids by pipeline and fractionate these liquids into commercial grade products, including ethane, propane, butanes, and natural gasoline
6/12/2013	AQ1201CPT02	1/8/2014	AK-0081	Point Thomson Production Facility	17.210	Unspecified (493 HP)	USLD	Good combustion and operating practices.	PM: 0.20 g/kw-hr	Combustion	Oil/Gas Exploration and Production Facility. The facility contains electric power generating stations, power distribution facilities, water treatment facilities, wastewater treatment facilities, waste management facilities, oil spill response equipment, and others
10/15/2012	MD-12620	4/14/2016	WY-0071	Sinclair Refinery	17.210	Emergency Air Compressor (400 HP)	ULSD	Use of certified EPA Tier 3 engine and limited hours of operation.	Unspecified	Emergency Air Compressor	Crude Oil Refinery

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
8/23/2012	2012--APP002157	7/25/2017	CA-1217	Bea San Diego Ship Repair	17.210	Generator Engine (450 HP)	Diesel	Unspecified	NOx: 1.34 g/HP-hr	ICE - 450 BHP Model QSX15-C - Cummins	Unspecified
6/1/2012	15-0027K	2/19/2020	PA-0282	Johnson Matthey Inc / Catalytic Systems DIv	17.210	Emergency Generator (400 kW)	#2 Oil	Limited hours of operation.	NOx: 6.39 g/bhp-hr	400-kW Diesel Emergency Generator	Unspecified
5/30/2012	OCS-EPA-R4008	5/4/2016	FL-0338	Sake Prospect Drilling Project	17.210	Diesel Engines (305 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	Unspecified	Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs	The facility consists of a mobile offshore drilling unit (MODU) using either the Transocean ultra-deepwater C.R. Luigs or the Transocean semisubmersible DD1 to conduct exploratory oil and natural gas drilling in lease blocks within the DeSoto Canyon area of the Gulf of Mexico.
					17.210	Diesel Engines (860 HP & 490 HP)	Diesel		Unspecified	Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs. Cementing Units: Caterpillar 3412 CDITA 860 hp 2001 Nitrogen Pump: Caterpillar 3406 CDITA 490 hp 2000	
					17.210	Diesel Engines (300 HP)	Diesel		Unspecified	Wireline Unit Engines - C.R. Luigs	
					17.210	Diesel Engines	Diesel		Unspecified	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	
					17.210	Diesel Engines	Diesel		Unspecified	Wireline Unit Diesel Engines - Development Driller 1	
					17.210	Air Compressor (6 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for the engine and the use of low sulfur diesel fuel	Unspecified	Black Start Air Compressor - C.R. Luigs	
					17.210	Diesel Engine (142 HP)	Diesel		Unspecified	Fast Rescue Craft Diesel Engine - C.R. Luigs	
					17.210	Diesel Engines (39 HP)	Diesel		Unspecified	Life Boat Diesel Engines - C.R. Luigs	
					17.210	Diesel Engines (110 HP)	Diesel		Unspecified	Life Boat Diesel Engines - Development Driller 1	
					17.210	Diesel Engines (142 HP)	Diesel	Use of good combustion practices based on the current manufacturer's specifications for these engines, use of low sulfur diesel fuel, and turbocharger	Unspecified	Fast Rescue Craft Diesel Engine - Development Driller 1	

Table 6-6 RACT-BACT-LAER Clearinghouse Determination Summary: Small Diesel Internal Combustion Engines (< 500 HP)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	Equipment Description	Fuel	LAER/BACT Control Method Determination	Emission Information	Equipment Detailed Description	Extended Facility Description
2/8/2012	0160-0023	10/17/2012	SC-0113	Pyramax Ceramics, LLC	17.210	Emergency Engines (29 HP)	Diesel	Use of certified EPA engine and limited hours of operation.	NOx: 7.5 g/kw-hr CO: 5.5 g/kw-hr VOC: 7.5 g/kw-hr	Emergency engines 1 through 8	Pyramax ceramics plans to construct a manufacturing facility for the production of proppant beads for use in the oil and gas industry. The major raw material is clay. The clay is mixed with chemicals and then fired in a kiln to produce ceramic beads. Initial construction permit for a greenfield facility.

ACC = acir-cooled condenser
BHP = brake horsepower
CCCT = combined-cycle combustion turbine
CT = combustion turbine
CTG = combustion turbine generator
FRAP = Flat Rock Assembly Plant
GE = General Electric
hr/yr = hour per year
HRSG = heat recovery steam generator
ITR = ignition timing retardation
lb/MMBtu = pounds per million British thermal units
LNG = liquified natural gas
MMBtu/hr = million British thermal units per hour
PVC = polyvinyl chloride
STG = steam turbine generator
tpd = tons per day

6.4.2. CARB and SCAQMD Databases

In addition to the RBLC search conducted for large and small diesel-fired engines, the CARB and SCAQMD Databases were searched for emissions standards for diesel-fired engines. There were four (4) determinations found in the last 10 years. The results are summarized in Table 6-7. As shown in the table, all of the determinations showed use of an EPA-certified engine. One of the engines had SCR and an oxidation catalyst added. Three of the four also had hourly or fuel limitations. In addition, most of the engines also deemed SCR not technically feasible because of low exhaust temperature of the engine, and three of the determinations showed the use of a particulate filter for PM control.

Table 6-7 California BACT Clearinghouse Determination Summary (CARB and SCAQMD)

Permit Date	Permit No.	Last Updated	Determination Number	Facility Name	Process Code	LAER/BACT Control Method Determination	Fuel	Equipment Detailed Description	Emission Information
2/1/2019	A/N 594294	2/1/2019	Sunshine Canyon Landfill	Emergency Portable CI Diesel Engine (123.4 HP)	Diesel	Tier 4 Final Limits. CI naturally aspirated with SCR, oxidation catalyst, and ammonia oxidation catalyst.	NOx: 2.5 g/HP-hr CO: 3.7 g/bhp-hr PM/PM_{10}: 0.01 g/HP-hr VOC: 0.14 g/bhp-hr	Caterpillar Portable IC Engine Model C4.4	Drives landfill refuse truck tipper which powers a hydraulic pump that raises and lowers two hydraulic cylinders and tipper platform.
12/10/2015	A/N 516409	12/2/2016	U.S. Government VA Medical Center	Emergency CI Diesel Engine (374 HP)	Diesel	Turbocharger and aftercooler. Limited to 200 hr/yr which includes no more than 50 hr/yr and 4.2 hour/month for maintenance and testing. Engine shall not be operated in idle mode for more than 240 consecutive minutes. Diesel particulate filter required to reduce toxic risk from diesel particulate emissions, but also reduces PM_{10}.	NOx+VOC: 3 g/HP-hr CO: 2.6 g/HP-hr PM/PM_{10}: 0.15 g/HP-hr	Caterpillar IC Engine Model C9	Drives an emergency electricity generator.
12/10/2015	A/N 558397	12/2/2016	University of Southern California	Emergency CI Diesel Engine (755 HP)	Diesel	Turbocharger and aftercooler. Limited to 200 hr/year which includes no more than 50 hr/yr and 4.2 hours per month for maintenance and testing. Diesel particulate filter required to reduce toxic risk from diesel particulate emissions, but also reduces PM_{10}	NOx+VOC: 4.8 g/HP-hr CO: 2.6 g/HP-hr PM/PM_{10}: 0.01 g/HP-hr	Cummins IC Engine Model QSX15-G9	Drives an emergency electricity generator.
12/10/2015	A/N 516708	12/2/2016	Los Angeles County Sheriff's Department	Emergency CI Diesel Engine (2,220 HP)	Diesel	Turbocharger and aftercooler. Limited to 200 hr/yr which includes no more than 50 hr/yr and 4.2 hours per month for maintenance and testing. Diesel particulate filter required to reduce toxic risk from diesel particulate emissions, but also reduces PM_{10}.	NOx+VOC: 4.8 g/HP-hr CO: 2.6 g/bhp-hr PM/PM_{10}: 0.15 g/HP-hr	Cummins IC Engine Model QSK50-g4	Drives an emergency generator.

Note: the search parameters were for ICE Portable & Stationary; Emergency, CI; Emergency, Spark Ignition, ICE – Portable, CI; and ICE – Stationary, Non-Emergency.
g/BHP-hr = grams per brake horsepower-hour

6.5. BACT and LAER Analyses

A top down BACT five-step analysis was completed to evaluate LAER/BACT for NOx and VOC and BACT for CO, $PM_{10}/PM_{2.5}$ and GHG as CO_{2e} for the engines used during construction, operation, and maintenance of Revolution Wind. This included:

- Step 1 – Identify All Control Technologies
- Step 2 – Eliminate Technically Infeasible Options
- Step 3 – Rank Remaining Control Technologies by Control Effectiveness
- Step 4 – Evaluate Most Effective Controls and Document Results
- Step 5 – Select BACT (LAER)

Each of those steps have been evaluated for NOx, CO, $PM_{10}/PM_{2.5}$, VOC and GHG as CO_{2e} control options as described as follows.

6.5.1. Step 1 – Identify All Control Technologies

The RBLC, CARB, and SCAQMD databases search results are summarized in Tables 6-4, 6-5, and 6-6 for engines of similar size and fuel. In addition, a broad range of other information sources also were reviewed in an effort to identify all potentially applicable NOx, CO, $PM_{10}/PM_{2.5}$, VOC and GHG as CO_{2e} emission control technologies used in practice today. From these tables, potential NOx, CO, $PM_{10}/PM_{2.5}$, VOC and GHG as CO_{2e} control technologies options are listed as follows.

6.5.1.1. NOx Controls

Of over 200 total determinations evaluated, there were only three (3) entries that identified SCR as a NOx control technology in the three databases. The other control technologies identified for NOx control from the database searches, including SCR, are as follows.

- Use of certified engine/compliance with NSPS or RICE MACT
- Good combustion practices
- Limited hours of operation
- Engine design, including turbocharging and aftercooling
- Selective catalytic reduction (SCR)

6.5.1.2. CO & VOC Controls

CO and VOC are both products of incomplete combustion. Since CO and VOC are typically formed from the same mechanisms, emissions of CO and VOC are controlled using similar technologies. Of over 200 total determinations evaluated, there were only three (3) entries that identified an oxidation catalyst as a CO and/or VOC control technology in the three databases. The other control technologies identified for CO and VOC control from the database searches, including oxidation catalyst, are as follows.

- Use of certified engine/compliance with NSPS or RICE MACT
- Good combustion practices
- Limited hours of operation
- Engine design, including turbocharging and aftercooling
- Oxidation catalyst (CatOx)

6.5.1.3. $PM_{10}/PM_{2.5}$ Controls

Most of the database determinations did not identify different control technologies by pollutant. However, for those that did, the PM control technologies listed were as follows. Only three (3) entries of the over 200 database results listed PM filters

- Use of ULSD
- Proper design/good combustion
- PM filters/diesel oxidation catalyst (DOCs)

6.5.1.4. GHG as CO2e Controls

Massachusetts regulations define GHG as carbon dioxide, methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons. Of these, hydrofluorocarbons are not products of combustion and will not be emitted by the Project. The N_2O will be controlled as NOx, and CH_4 will be controlled by good combustion practices (no significant fugitive emissions of CH_4 are expected). This BACT analysis focuses on CO_2 emissions as the primary GHG component. The control technologies identified for GHG as CO2e control from the database searches are as follows.

- Good combustion practices
- Limited hours of operation

6.5.2. Step 2 – Eliminate Technically Infeasible Options

Each of the identified control technologies are discussed in detail in this section and evaluated for technical feasibility. If a control technology is considered technically infeasible, it was eliminated from further evaluation.

6.5.2.1. NOx Option Evaluation

Each control technology option for NOx emissions is evaluated in the following sections.

Engine Design/Combustion Design

Engines may be certified by manufacturers to meet certain standards. The NSPS and RICE MACT standards require that engines be certified to specific emissions standards (or performance-tested to show that they will meet such standards). These specific standards are discussed in Section 6.2. Engine design for emissions is a feasible option for the Revolution Wind engines. This is a feasible technology.

Good Combustion Practices

Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. This option is technically feasible in reducing criteria pollutant emissions from the engines.

Engine Design/Turbocharging and Aftercooling

Turbochargers reduce emissions by increasing air flow to the combustion chamber. Turbochargers use the pressure of the exhaust gas to drive a turbine/compressor into the combustion air intake system, forcing additional air into the combustion chamber for more power production. Aftercoolers employ heat exchangers in the combustion air system to reduce air temperature downstream of a turbocharger, thereby making the air denser and providing more oxygen for combustion. When used together, turbochargers and aftercoolers have been shown to achieve reductions. Turbocharging and aftercooling are feasible for the Revolution Wind engines.

Selective Catalytic Reduction

SCR is identified as a potential option for control of NOx emissions from the engines. SCR is an add-on NOx control that is placed in the exhaust stream. The SCR reduces NOx emissions by injecting ammonia or urea into the exhaust stream. The ammonia or urea in the presence of the catalyst reacts with NOx to form water and nitrogen. In the catalyst unit, the ammonia reacts with NOx primarily by the following equations:

$$4\ NH_3 + 6\ NO = 5\ N_2 + 6\ H_20\text{; and}$$

$$8\ NH_3 + 6\ NO_2 = 7\ N_2 + 12\ H_20$$

SCR has been shown to achieve NOx reductions from 80 to 95 percent; however, an SCR does not operate properly until optimal exhaust temperatures are achieved. In the cases of emergency engines used in the Project, because the engine would typically be operated for less than 1-hour during routine maintenance testing, a large portion of the emissions would be uncontrolled until the optimal operating temperature is reached. As a result, SCR for an emergency engine is not an effective control technology.

For the case of non-emergency engines used on transport vessels, the engine likely will be operating at idle much of the time during the construction of the WTGs. Engines operating at idle will not achieve the optimal exhaust temperature for effective use of the NOx catalyst and SCR system.

6.5.2.2. CO and VOC Option Evaluation

Each control technology option for CO and VOC emissions is evaluated in the following sections.

Engine Design/Combustion Design

Engines may be certified by manufacturers to meet certain standards. The NSPS and RICE MACT standards require that engines be certified to specific emissions standards (or performance-tested to show that they will meet such standards). These specific standards are discussed in Section 6.2. Engine design for emissions is a feasible technology option for the Revolution Wind engines.

Good Combustion Practices

Good combustion practices entail operating the engine according to the manufacturer’s recommendations and generally accepted industry practices. This option is technically feasible in reducing criteria pollutant emissions from the engines.

Engine Design/Turbocharging and Aftercooling

Turbochargers reduce emissions by increasing air flow to the combustion chamber. Turbochargers use the pressure of the exhaust gas to drive a turbine/compressor into the combustion air intake system, forcing additional air into the combustion chamber for more power production. Aftercoolers employ heat exchangers in the combustion air system to reduce air temperature downstream of a turbocharger, thereby making the air denser and providing more oxygen for combustion. When used together, turbochargers and aftercoolers have been shown to achieve reductions. Turbocharging and aftercooling are feasible for the Revolution Wind engines.

Oxidation Catalyst

CatOx is identified as a potential option for control of CO and VOC emissions from the engines. CatOx is an add-on CO and VOC control that is placed in the exhaust stream. The CatOx reduces CO and VOC emissions by oxidation without the use of reagents.

Oxidation catalysts are a proven technology for compression ignition engines; however, an CatOx does not operate properly until optimal exhaust temperatures are achieved. In the cases of emergency engines used in the Project, because the engine would typically be operated for less than 1 hour during routine maintenance testing, a large portion of the emissions would be uncontrolled until the optimal operating temperature is reached. As a result, CatOx for an emergency engine is not an effective control technology.

For the case of non-emergency engines used on transport vessels, the engine likely will be operating at idle much of the time during the construction of the WTGs. Engines operating at idle will not achieve the optimal exhaust temperature for effective use of the oxidation catalyst.

6.5.2.3. $PM_{10}/PM_{2.5}$ Option Evaluation

Each control technology option for $PM_{10}/PM_{2.5}$ emissions is evaluated in the following sections.

6.5.2.3.1 Use of Clean-Burning, Low-Sulfur Fuel

Use of clean-burning, low-sulfur fuel will reduce PM emissions as the fuel sulfur content is a direct contributor to non-volatile PM emissions. Cleaner burning fuels would be distillate or light fuels, which will result in lower unburned carbon emissions, another direct contributor to PM emissions.

6.5.2.3.2 Engine Design/Good Combustion Practices

Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. This option is technically feasible in reducing criteria pollutant emissions from the engines.

6.5.2.3.3 Use of PM Filter/Diesel Oxidation Catalysts

In 2014, EPA Region 4 determined that DOCs are not technically feasible for marine internal combustion engines because the technology can cause back pressure on the engines, which poses a safety hazard, so this option has been technically eliminated.

6.5.2.4. GHG as CO2e Option Evaluation

Each control technology option for GHG as CO_{2e} emissions is evaluated in the following sections.

6.5.2.4.1 Good Combustion Practices

Revolution Wind proposes to utilize clean fuels, efficient engine operation and good combustion practices to control GHG as CO2e.

6.5.3. Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Remaining technically feasible control alternatives are ranked in order of most effective (that is, lower to highest emission rates) for NO_x CO, $PM_{10}/PM_{2.5}$, VOC and GHG as CO_{2e} in the following sections.

6.5.3.1. NOx Control Technologies

The NOx control technologies ranked in order of effectiveness (from most effective to least effective) are as follows:

- Engine Design/Combustion Design
- Good Combustion Practices
- Engine Design/Turbocharging and Aftercooling

However, each of these control technologies taken separately likely will provide equal levels of emission controls. All of these technologies have been used to reduce NOx emissions from diesel-fired engines and all of these technologies are listed in the RBLC, CARB, and SCAQMD databases.

6.5.3.2. CO & VOC Control Technologies

The CO control technologies ranked in order of effectiveness (from most effective to least effective) are as follows:

- Engine Design/Combustion Design
- Good Combustion Practices
- Engine Design/Turbocharging and Aftercooling

6.5.3.3. $PM_{10}/PM_{2.5}$ Control Technologies

The $PM_{10}/PM_{2.5}$ control technologies ranked in order of effectiveness (from most effective to least effective) are as follows:

- Use of clean-burning, low-sulfur fuel
- Good combustion practices

6.5.3.4. GHG as CO2e Control Technologies

The most effective GHG as CO_{2e} control technology is good combustion practices.

6.5.4. Step 4 – Evaluate Most Effective Controls and Document Results

6.5.4.1. NOx Control Technologies

As previously stated, each of these control technologies are equally effective. They work hand-in-hand in that an engine design certified by the manufacturer to meet the NSPS and RICE MACT regulations will have incorporated good combustion design, which will lead to good combustion practices. Good engine design might entail the use of turbocharging and aftercooling to meet the regulatory emission standards.

6.5.4.2. CO and VOC Control Technologies

Each of the CO and VOC technologies is equally effective. They work hand-in-hand in that an engine design certified by the manufacturer to meet the NSPS and RICE MACT regulations will have incorporated good combustion design, which will lead to good combustion practices. Good engine design might entail the use of turbocharging and aftercooling to meet the regulatory emission standards.

6.5.4.3. $PM_{10}/PM_{2.5}$ Control Technologies

Each of the PM control technologies is equally effective. Using lower sulfur fuels minimizes PM emissions by reducing the non-volatile portion of particulate which contributes to total PM emissions. Good combustion practices will minimize PM by resulting in lower unburned carbon.

6.5.4.4. GHG as CO2e Control Technologies

The most effective GHG as CO_{2e} control technology is good combustion practices.

6.5.5. Step 5 – Select BACT (LAER)

6.5.5.1. NOx BACT/LAER

BACT/LAER for the engines used during the construction and O&M phases is considered to be engine design and good combustion practices. BACT/LAER should include work practices such as reduced idling when possible, using low-sulfur fuel oil, conducting regular maintenance on the engines, and using engines meeting EPA certification or International Maritime Organization standards, where possible. This is supported by the findings in the RBLC, CARB, and SCAQMD database search results, where it showed BACT/LAER for engines was the use of good combustion practices and generally following the NSPS emission standards for large engines included in 40 CFR 60 Subpart IIII.

For engines with a displacement greater than or equal to 30 liters per cylinder, BACT/LAER would be to certify to the emission standards summarized in Table 6-1 for NOx emissions. For smaller engines, BACT/LAER would be to certify the engines to the respective emission limitation and work practice standards in the applicable NSPS and RICE MACT regulations. For gasoline-fired engines, BACT/LAER would be to certify to the emission standards in 40 CFR 60 Subpart JJJJ for SI RICE. For older engines, they will meet the appropriate standards for their size and model year. Generally, emergency engines installed on WTG and at the OSS will be new and Revolution Wind will purchase the highest tier required for their engine type.

6.5.5.2. CO BACT and VOC BACT/LAER

BACT for CO and BACT/LAER for VOC for the engines used during the construction and O&M phases is considered to be engine design and good combustion practices. Similar to the NOx BACT/LAER selection, BACT for CO and BACT/LAER for VOC should include work practices such as reduced idling when possible, conducting regular maintenance on the engines, and using engines meeting EPA certification or International Maritime Organization standards, where applicable. A cost analysis for BACT is not included here as Revolution Wind will implement the BACT options identified in this analysis.

6.5.5.3. PM_{10}/$PM_{2.5}$ BACT

BACT for PM for the engines used during construction and O&M phases is considered to be use of low sulfur fuels and engine designs using good combustion practices. Similar to the NOx BACT/LAER selection, BACT for PM should include work practices such as reduced idling when possible, using low-sulfur fuel oil, conducting regular maintenance on the engines, and using engines meeting EPA certification or International Maritime Organization standards, where possible. A cost analysis for BACT is not included here as Revolution Wind will implement the BACT options identified in this analysis.

6.5.5.4. GHG as CO2e BACT

Revolution Wind proposes to utilize clean fuels, efficient engine operation and good combustion practices to control GHG as CO2e.

6.5.6. Additional Considerations

For construction and O&M of the Project, Revolution Wind will use a fleet of industry-ready marine vessels. Though Revolution Wind will request the highest tiered vessel, the Project may be limited to those vessels that are owned and operated by the awarded contractor. The vessels needed for construction of the Project are extremely specialized, and therefore a limited number of vessels capable of conducting the work are available. As such, these vessels are in high demand due to competing wind development area projects worldwide. At this time, most of these specialized vessels are located in Europe, so mobilization of such a vessel would result in increased emissions to the Project. In addition, waiting for the “highest tiered” engine at the time of the scheduled deployment would affect the construction timetable as the construction schedule is carefully sequenced, and almost every activity is dependent on the completion of the previous activity. Delaying the mobilization of a vessel since it did not have the highest tier engine could jeopardize the overall schedule significantly. There are limited work windows to construct the Revolution Wind Farm due to weather, environmental permit constraints, as well as contractual obligations under the power purchase agreements. It is expected that the construction season will run from spring to late fall which allows Revolution Wind to minimize its activities on the OCS during the winter months when weather conditions are the most hazardous. Delaying the Project into the winter would result in more hazardous working conditions, time of year restrictions, and further delays. These delays can ultimately jeopardize Revolution Wind’s contractual obligations.

6.6. Offset Requirements

As part of the NNSR permit application process, and before Project operation can begin, Revolution Wind must obtain and retire emission reductions (offsets) for NO_x and VOC to offset the net increase in NO_x and VOC emissions into the atmosphere resulting from the Project.

Obtaining offsets is a part of the demonstration of reasonable further progress, which requires that the total emissions from existing sources in the area, from new or modified sources which are not major stationary sources, and from the proposed source, will be sufficiently less than the total emissions from existing sources prior to the application for the proposed source.

Emission offset requirements are detailed in 310 CMR 7.00: Appendix A (6). These regulations indicate that prior to commencing the operation of any emission unit for which offsets are required, the NO_x and VOC emission offset must actually occur and be obtained from the same source or other sources within the same nonattainment area as the source is located. The increase in emissions of NO_x and VOC from the Project must be offset by a ratio of total actual emission reductions to the increase in actual emissions of 1.2:1 of NO_x or VOC as indicated in 310 CMR 7.00: Appendix A(6)(e). An additional 5% in NO_x offsets is required as part of a set aside mandated by the Massachusetts PBSA program for a total NO_x offset requirement of 1.26:1. As discussed in Section 5.2.2.1, the purchase of offsets will be required for the O&M phase of the Project.

The total amount of mass-based NOx offsets required for the O&M phase of the Project is summarized in Table 6-8. The total amount of mass-based VOC offsets required for the O&M phase of the Project is summarized in Table 6-9. The quantity of rate-based offsets (tpy) needed for the O&M phase (or the life of the Project) is the estimated NOx emissions during the O&M phase multiplied by the offset ratio of 1.26 and the estimated VOC emissions during the O&M phase multiplied by the offset ration of 1.2. During the O&M phase, only mass-based (tons) of NOx and VOC offsets will be required to be purchased for the emissions that will occur for the operating life of the project. If any offsets will need to be purchased during the decommissioning phase of the project, those will be decided at a future date.

Note that Revolution Wind and EPA are engaged in ongoing discussions regarding source determinations for the Project. A justification for excluding the WTGs from the source determination is presented in Appendix A. Based on the outcome of EPA's response to Appendix A, Revolution Wind may submit an amendment to this application, which may determine different offset requirements than what is estimated in Table 6-8 and 6-9.

Table 6-8 Project NOx Rate-Based Offsets Required During O&M Phase

OCS Area	NOx Emissions (tons)	NOx Offsets Needed (tons)
RWF OCS	168.4	212.2

Table 6-9 Project VOC Rate-Based Offsets Required During O&M Phase

OCS Area	VOC Emissions (tons)	VOC Offsets Needed (tons)
RWF OCS	4.2	5.0

NNSR offsets are required to be obtained from sources within the same nonattainment area or may be obtained from another area if two criteria are met: 1) the other area has an equal or higher nonattainment classification than the area in which the source is located; and 2) where the proposed new source or modified source is located in a nonattainment area, emissions from such other area contribute to a violation of a national ambient air quality standard in the nonattainment area in which the proposed new or modified source would construct. Dukes County is the nearest onshore area to the Project and is classified as a marginal nonattainment area with the 2008 8-hour ozone standard. Due to lack of availability of NO_X offsets within Dukes County, Revolution Wind may need to obtain NNSR offsets using ERCs from another classified area.

Within the South Fork Wind Fact Sheet, dated October 20, 2021, EPA has already determined that the state of Massachusetts satisfies the two criteria. Therefore, Revolution Wind will seek to obtain offsets from within Massachusetts. Revolution Wind will engage with EPA if offsets are being sought from a state outside of Massachusetts.

6.7. State BACT Evaluation

The Massachusetts regulations contained in 310 CMR 7.02(8)(a) stipulate that a state BACT analysis is required for all LPA and CPA approvals. Top down BACT emission rates are included in the state's BACT guidance document entitled "MassDEP Top Case Best Available Control Technology (BACT) Guidelines – Combustion Sources" with emission data dated June 2011. If an emission source can meet each relevant pollutant-specific emission limit from MassDEP's Top Down BACT guidance, no further BACT analysis is required. However, if an emission unit cannot meet one of the BACT guidance emissions limits, then the facility can propose an emission control limitation as detailed in 310 CMR 7.02(8)(a)2.a and/or b. Subsection 2.a. states, "Propose a level of control from the most recent plan approval or other action issued by the Department (Top Case BACT)" and subsection 2.b. states, "Propose a combination of best management practices, pollution prevention, and a limitation on the hours of operation and/or raw material usage." Section 2.b is only applicable if the proposed allowable emissions, calculated over any consecutive 12-month time period, are: (1) Less than 18 tons VOC and HOC combined, (2) less than 18 tons of total organic material HAP, and (3) less than ten tons of a single organic material HAP.

As previously discussed, the MassDEP BACT guidance document does not include air contaminants that are subject to LAER under 310 CMR 7.00, Appendix A (that is, the NNSR). In addition, CO, $PM_{10}/PM_{2.5}$, and VOC are subject to a Federal BACT analysis. As such, this BACT analysis includes an analysis only of SO_2, emissions from the engines used for propulsion of vessels or on vessels. No further discussions of NO_x, CO, $PM_{10}/PM_{2.5}$ or VOC emissions are included in this section. In addition, in MassDEP's BACT Guidelines, lead is not listed for reciprocating ICE or otherwise regulated for ICE in their rules so is not discussed further in this section. The PSD regulatory analysis in Section 5.1.1 shows that the project does not trigger PSD permitting for lead.

The BACT for SO_2 would be the use of low sulfur fuel, where technically feasible for the engine.